ACTED ACT FOR CHANGE INVEST IN POTENTIAL

INTERNATIONAL CALL FOR TENDER FOR PROVISION OF LANDFILL WORKS THROUGH PRE-QUALIFICATION PROCESS - ACTED Iraq

Date: **07/03/2017**

Tender N°:   **T/10CFD/T12/ISI/LANDFILL_WORK/ERB/07032017/001**

ACTED is requesting, through this prequalification, a company to provide detailed written intention for the provision of the following works being selected through a later invitation to bid:

GENERAL WORKS DESCRIPTION

1. Description: **CONSTRUCTION OF A LEACHATE TREATMENT FACILITY AT KWASHE MUNICIPAL LANDFILL**

2. Product class / category: Works

3. Product stage: Final

4. INCOTERM (delivery conditions): **DDP[1] – Kwashe Municipal Landfill**

    Constructor is responsible for all and any installation, configuration, testing or related works for the delivery of a fully operational facility.

5. Validity of the offer: **Six (6) months**

PROJECT OVERVIEW

A. CONTEXT

ACTED, a French NGO, has been working in Iraq since 2003 providing humanitarian support to vulnerable populations through multi-sector emergency assistance. ACTED has been operational in the Kurdistan Region of Iraq since 2007 initially working to build the capacity of civil society organizations and, since early 2013, responding to the Syrian refugee crisis through the provision of food, camp management and child protection services.

ACTED, with funding from the Canadian Government through Global Affairs Canada (GAC), has been engaged to implement a waste water treatment facility at Kwashe landfill in Dohuk governorate, Kurdistan Region of Iraq. Implementation of this project will improve the environmental sanitation of the site and improve the capacity of municipal authorities in regards to solid waste management. This project is part of a wider programme to improve community resilience in the wake of the nearby on-going conflict.

B. LANDFILL SUMMARY

The Kwashe sanitary landfill is located near the city of Kwashe, in the district of Summel, and about 20km northwest of Dohuk, in the Dohuk Governorate of Iraq Kurdistan. The area where the landfill is located consists in a mix of industrial and residential spaces, and is the only formal facility that provides some degree of solid waste processing for the entire governorate.

Since 2014, the population influx has placed additional burden to the landfill, and increased the negative environmental effects of its current configuration. The Directorate-general of Municipalities of Duhok Governorate is the government agency responsible for the solid waste service management in the region.

This landfill is located about 36.9745 degrees north, and 42.8088 degrees east, and has a total capacity of processing 800 tons of waste per day, and consists of: 1) Sorting facility, where it is located a sorting station for recyclable materials and a composting station, and 2) Sanitary cell.

Since its construction (in 2012), there is no leachate treatment and management strategy or infrastructure in place, and consequently all generated leachate simply flows onto the open ground, resulting in high levels of soil contamination.

---

[1] DDP - "Delivered Duty Paid" means that the seller delivers the goods when the goods are placed at the disposal of the buyer, cleared for import on the arriving means of transport ready for unloading at the named place of destination. The seller bears all the costs and risks involved in bringing the goods to the place of destination and has an obligation to clear the goods not only for export but also for import, to pay any duty for both export and import and to carry out all customs formalities. (http://www.iccwbo.org/products-and-services/trade-facilitation/incoterms-2010/the-incoterms-rules/).

C. PROPOSED ACTIVITIES

In the scope of this project, ACTED proposes to install a leachate treatment plant (LTP) in Kwashe Landfill, with a total treating capacity of **3 m³/h** (or **72 m³/d**), as a design effluent flow, in order meet the discharge standards for irrigation purposes of Iraqi Kurdistan.

The complete treatment process will consist of sedimentation as the primary treatment, followed by a membrane biological reactor (MBR) as the biological/secondary treatment, and either Nano-filtration (NF) or Reverse Osmosis (RO) for tertiary/advanced treatment.

All required design inputs (i.e. dimensioning parameters) have been collected by ACTED, and bidders are requested to propose a design that incorporates these factors, and also best fit to the local context. The successful bidder will be engaged to implement the winning design

Additional details of the landfill including leachate properties, discharge limits and design considerations, are discussed in the attached **KWASHE LANDFILL LEACHATE TREATMENT PLANT - TECHNICAL SPECIFICATION AND SUPPORT DOCUMENTS** (following this tender form).

CONSTRUCTION PERIOD

6 MONTHS ESTIMATED. (BIDDERS WILL CLEARLY EXPLAIN IN THEIR GANTT CHART THE CONSTRUCTION WORK PLAN)
ADDITIONALLY THE COMPANY WILL BE REQUESTED TO PROVIDE EXTRA SUPPORT FOR THE NEXT 12 MONTHS, AS STIPULATED IN THE SECTION 4.1 (ITEM #10) AND SECTION 4.3. THIS PERIOD WILL REFLECT IN A WARRANTY HELD UNTIL THE END OF HANDOVER AND ASSISTED OPERATION PERIOD.

GENERAL CONDITIONS:

1. The **closing date** of this pre-qualification is fixed **on 28/03/2017 (March 28th, 2017) at 17:00 (Iraq time).** All the documentation must be sent at ACTED office at the following address:
   ACTED representative office in Erbil, IRAQ (6th street (Khabat street) on the right after Ankawa intersection,1st street on the right, House #: 240/1/467 Hadiyab quarter, Ainkawa, Erbil, Iraq)
   ACTED representative office in Dohuk: Golvin 67 St. Malta Islam Quarter - Dohuk 3rd Street from Malta Hill Traffic Light to **Down Town**

   Or emailed to both: iraq.tender@acted.org and tender@acted.org

2. This prequalification process has a question and clarification session to be held in Dohuk on the **19th and 20th of April, 2017** upon schedule of the session through a formal request by letter to the above mentioned physical or digital addresses

3. All documents shall be submitted in English. Certificates and official documents shall be submitted in English, Kurdish or Arabic.

4. Bidders will fill, sign, stamp and return the documents according to ACTED's format.

5. The pre-qualification will not result in the award of a contract.

6. Any cost incurred due to the submission of any document or attendance to any phase of this selection process shall be entirely responsibility of the candidate and not refundable in any stage, including on the eventuality of the award of this contract.

7. The pre-qualification must be submitted to ACTED purchase department in a sealed envelope with the mention T/10CFD/T12/ISILANDFILL_WORK/ERB/07032016/001 - not to be opened before 28/03/2016".

8. Unsealed envelopes and late offers will not be considered.

SPECIFIC CONDITIONS:

1. All units of measurements shall be in accordance with the S.I. system of metric unit.
2. All bidders must submit an anticipated design for both treatment processes:
   a) **Membrane biological reactor** (MBR) combined with **Nanofiltration** (NF), and
   b) **Membrane biological reactor** (MBR) combined with **Reverse Osmosis** (RO).

Bidders also have the option of submitting a bid on an **alternative treatment process** (beside the above-mentioned processes, if proven more efficient).

3. Offer with less than 6 months of validity will not be considered.

4. The documents to be presented to ACTED shall clearly showcase the two (or more) treatment options separately

5. **Bill of quantities:** The information presented in the attached technical specification on the design of the leachate treatment plant and its associated bill of quantities shall be considered as a baseline at this stage and subject to adjustments on the second stage of this tender. Bidders should submit detailed bill of quantities based on these information and proposed treatment stages. If other solutions are suggested, bidders will clearly justify their alternative bill of quantities.

6. Bidders must present a valid copy of all their registration within Kurdistan Region of Iraq or demonstrate capacity to be legally able to work in the area before the signature of the contract.

7. Preference is given to contractors with proof of experience in large scale similar projects in the humanitarian sector.

8. On the later stage of this tender process, the rates quoted by the tender in the Bill of Quantities will be deemed to be for the finished work and shall include all charges for permanent, temporary and support works, supplies and services. All taxes, duties, fines and auxiliary costs for the delivery, installation, construction or supervision of any of the related works shall be of responsibility of the successful bidder as per INCOTERMs definition (for supplying) and any works hereby defined.

9. Payment will be performed in US Dollar (USD), hereby selected as the contractual currency for this tender.

10. Payments from ACTED to the successful candidate will be done through bank transfer.

11. ACTED reserves the right to contact previous experiences and any financial or security authority for verification.

12. The contractor shall follow Iraqi Standards for construction activities: General Conditions of Contract for Kurdistan Regional Government, Specifications of Housing and Reconstruction, Republic of Iraq, Specifications of Iraqi State Organization for Roads and Bridges (SORB)

13. During the implementation of this project, the successful bidder will report technically to ACTED WASH Programme Manager.

14. The successful bidder shall demonstrate enough liquidity and financial capacity to implement the project with partial reception of payment or in case of transfer delays due to force majeure;

15. The successful pre-qualified candidate shall be capable to contribute on the final design based off the initial design information provided by ACTED. All works shall be done according to the respective engineering standards and best practices, where the contractor is responsible to be knowledgeable of the said standards and practices.

16. The successful pre-qualified candidate must have read in full and understood the **KWASHE LANDFILL LEACHATE TREATMENT PLANT - TECHNICAL SPECIFICATION AND SUPPORT DOCUMENTS** (following this tender form), and all other attached documentation. It is the responsibility of the contractor to raise and discuss any concerns or uncertainties with ACTED prior to the submission of a bid.

PRE-QUALIFICATION EVALUATION CRITERIAS

1. The prequalification criteria for the acceptance of qualified bidders, if not further modified, will be:

#	Subject	Requirement	Rating (0-100)	Submission documents
1	**Ethical declaration & Declaration of undertaking**	Business ethics are met and company can provide proof of exonerated past	**Yes/No (exclusion criteria)**	Applicant Ethical declaration
2	**History of Non-Performing Contracts**	Non-performance of a contract did not occur within the last 3 years prior to the deadline for application submission	**Yes/No (exclusion criteria)**	
3	**Pending Litigations**	All pending litigations shall in total not represent more than 10 % of the Applicant's net worth. Company shall provide lawyer attest of likelihood/impact of all pending litigations Company shall provide negative certificate of tax debts or equivalent.	**Yes/No (exclusion criteria)**	Applicant's questionnaire and specific documents
4	**Experience**	Contract award history demonstrates the applicant's ability to work within the country or similar environments. Contractor demonstrates previous experience in similar projects and expertise in the design and construction of industrial wastewater treatment plant.	**0-40**	
5	**Resources**		**0-40**	
5.a.	**- financial**	Solvency (Debt Ratio): <Total Liabilities (TL) / Total Assets (TA)> shall be equal or smaller than 0.4 Liquidity (Current Ratio):< Current Assets (CA) / Current Liabilities (CL)> shall be equal or bigger than 1	Yes/No (exclusion criteria)	
5.b.		Attached are copies of financial statements (balance sheets,	Yes/No	

		including all related notes, and income statements) for the 3 years required below; and complying with the requirements. The Applicant shall provide copies of the balance sheets and/or financial statements for last 3 years that: (a) reflect the financial situation of the Applicant or partner to a JV, and not sister or parent companies. (b) be audited by a certified accountant. (c) be complete, including all notes to the financial statements. (d) correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).	(exclusion criteria)	
5.c.	**- manpower**	The Applicant demonstrates the capacity to ensure the presence of sufficient dedicated manpower over the works duration, as well as works supervision	0-20	
5.d.	**- equipment**	The Applicant demonstrates the availability of sufficient appropriate equipment for the timely works completion	0-20	
6	**Safety**	The Applicant demonstrates its reliability toward safety at works sites	**0-20**	
7	**Environment**	The Applicant demonstrates knowledge in Environmental protection as well as elaborating environmental management and monitoring plan (EMMP) for construction and operation of the proposed project.	**Yes/No (exclusion criteria)**	Example of an EMMP prepared in past experiences

DOCUMENTATION REQUIREMENT FOR PRE-QUALIFICATION

All pre-qualified suppliers must include the following documents, as a minimum standard:

1. **Company information**, expertise and list of past industrial wastewater projects (as stipulated in the invitation to prequalify);

2. **ID of legal representative;**

3. **Bill of quantities**: The information presented in the attached technical specification on the design of the leachate treatment plant and its associated bill of quantities shall be considered as a baseline at this stage and subject to adjustments on the second stage of this tender. Bidders should submit detailed bill of quantities based on these information and proposed treatment stages. If other solutions are suggested, bidders will clearly justify their alternative bill of quantities. (see section 4.1);

4. **Design proposal** including:
   a) Influent/effluent simulation (concentrations, mass loads),
   b) Plant sizing,
   c) **O&M costs (monthly and yearly costs)**: Complete breakdown of the total Operation & Maintenance (O&M) costs for the LTP: chemical materials, wear and tear parts, spare parts, energy costs, assuming (0.15 USD/kW for the energy costs).
   d) Performance specification including Process Flow Diagram (PFD), Max flow (during peaks) and electricity consumption (kWh/m^3).
   e) Supervisory control and data acquisition (SCADA), components and properties
   f) Other relevant design information

5. **MBR Technical specifications**:
   a) Membrane type, brand, model number (with detailed documentation to be provided)
   b) Number of membrane.
   c) Membrane area (per membrane, and total)
   d) Aeration method (jet aerator, diffuser, floating surface aerator, etc.)
   e) Design Flux: Influent/effluent flow for MBR (m^3/h)
   f) Guaranteed membrane life when operating under the conditions specified in the tender
   g) Specifications for other major components (blowers, sensors, pumps, valves, PLC, etc.)

6. **OPTION #1**: Reverse Osmosis technical specifications **in (MBR +RO) process:**
   a) Membrane type, configuration, brand, model number (with detailed documentation to be provided)
   b) Number of membrane modules.
   c) Membrane area (per membrane, and total)
   d) Flux (day average, Max), Recovery rate (r %) max and min, inlet pressure of feed stream (kPa).
   e) Guaranteed membrane life when operating under the conditions specified in the tender.
   f) Total operation cost (USD $/m³) for RO including all costs with a breakdown assuming 0.15 USD/kW for the energy cost.

7. **OPTION #2**: Nano-filtration technical specifications **in (MBR +NF) process:**
   a) Membrane type, configuration, brand, model number (with detailed documentation to be provided)
   b) Number of membrane modules.
   c) Membrane area (per membrane, and total)
   d) Flux (day average, Max), Recovery rate (r %) max and min, inlet pressure of feed stream (Kpa).
   e) Guaranteed membrane life when operating under the conditions specified in the tender.
   f) Total operation cost (USD $/m³) for NF, including all costs with a breakdown assuming 0.15 USD/kW for the energy cost.

8. **Running (O&M) costs** (supply of spare parts and consumables):
   a) Cost of replacement membrane/s
   b) List and cost of chemicals required for running the complete plant over the period of a year (this includes the chemicals for periodic membrane cleaning)
   c) List and cost of spare parts required as preventive maintenance over a year
   d) Labour hours needed for preventive maintenance over a year

9. **Implementation strategy**; including consideration of location, local context and certification to operate in Kurdistan Iraq

10. Proposal for **training and handover** (see Section 4.3) to ensure plant sustainability, including after-sales service and support

11. **Schedule of all construction activities**, material lead times, installation and other relevant activities, assuming an arbitrary starting date (using a *Gantt Chart*, **with a weekly scale**)

All pre-qualified suppliers will be contacted, and requested to provide the following additional documents:

1. Detailed specifications for all plant processes (P&ID); and major parts, equipment and materials
2. **Bill of quantities**: Detailed cost breakdown including unit costs and separated by equipment, service, fees, etc.
3. Detailed implementation plan including procurement, construction, handover, etc.
4. List of proposed locally engaged companies or organisations, including responsibilities and local certification(s)
5. Environmental management and health and safety plan for construction and operational phases (Section 4.2)

This list of documentations can also be found in section 5 – Prequalification documentations, in the **KWASHE LANDFILL LEACHATE TREATMENT PLANT - TECHNICAL SPECIFICATION AND SUPPORT DOCUMENTS** (following this tender form).

Tender Process Expected Schedule

Date:

Tender N°:   **T/10CFD/T12/ISI/LANDFILL_WORK/ERB/07032017/001**

Task	Scheduled Period
Prequalification Opening	March 7
Submission of Documents	March 7 – 28
Question Session	March 20 – 22
Interview and Offers Valuation	March 28 – April 10
Notice on Pre-qualified bidders	April 10 – 11
Tender Opening	April 11
Submission of Documents	April 11 – 25
Question Session	April 18 – 19
Offers Assessment	April 26 – May 1
Selection of Contractor	May 2 – 5

BIDDER'S QUESTIONNAIRE

Date:

Tender N°:   T/10CFD/T12/ISI/LANDFILL_WORK/ERB/07032017/001

A.   Company Name:

B. Company Owner(s) / Partners full names:	**C. Company Legal Autorized Representative for this Tender:**
1 2 3 4	Complete Name: _____ Position in the Company: _____ Signature: _____

D.   Additional Information about the Company:

1 Official Date of Registration: _____

2 Company Type / Profession as per Registration: _____

3 Full Name of the Three Company Representatives:

Name	Position	Location	Mobile Number

4 Company Telephone Number:
5 Company Fax Number:
6 Email Address:

7 Total number of full time employees (breakdown below):
   Total number of full time engineers:
   Total number of full time works superintendent:
   Total number of full time works supervisors:
   Total number of full time technicians:
   Total number of full time workers:

8 Company equipment/machinery as of January 1st 2015:
Please list your Company main equipment/machinery (machine, equipment, premises & warehouses, trucks & heavy machines, production center, etc)

No	Description	Location/Address	Quantity
1			
2			
3			
4			
5			

9 Have you worked with NGOs before? If Yes, please list them with detailed information:
-
-
-
-

10 Have you worked on similar types of projects before? If Yes, please list them below with detailed information (if needed please provide separate list):

Year	Client	Location	Type of work	Total amount transferred

Additional comments:

E. Past Performances:

1 Contract Award History

Please the last supply contracts awarded by your company over the last 3 years

No	Project Description	Location	Partner Name	Duration	Project Cost (USD)
1					
2					
3					
4					
5					

2 Historical contract non-performance:

☐ Contract non-performance did not occur during the 3 last years.

☐ Contract(s) partially/not performed during the 3 last years:

Year	Contract Description	Total Contract Amount (current value, US$ equivalent)	Non performed portion of contract
			[insert amount and percentage]

4 Pending litigations:

☐ No pending litigation

☐ Pending litigations:

Year	Contract Description	Total Contract Amount (current value, US$ equivalent)	Total Cost of the Case (Max Loss + Legal Costs)	Likelihood of Loss

5 Annual turnover data for the last 3 years (construction only)

Year	Contract Description	Total Contract Amount (current value, US$ equivalent)

6 Current list of on-going & projected works contracts (construction only)

Year	Contract Description	Total Contract Amount (current value, US$ equivalent)	Completion due date

F. Financial data:

Financial information in USD or IQD	Historic information for previous *3 years*		
	2015	**2014**	**2013**
Information from Balance Sheet			
1. Total Assets (TA)			
1.1. Current Assets (CA)			
1.1.1. Total Trade Receivables			
1.1.2. Inventory			
1.1.3. Cash and Cash Equivalent			
2. Total Liabilities (TL)			
2.1. Current Liabilities (CL)			
2.1.1. Trade and other payables			
2.1.2. Short-term borrowings			
Net Worth (NW)			
Information from Income Statement			
Total Revenue (TR)			
Profits Before Taxes (PBT)			

Parameter	Calculation	Result	Benchmark
Solvency (Debt Ratio)	Total Liabilities (TL) / Total Assets (TA)		<0.4
Liquidity (Current Ratio)	Current Assets (CA) / Current Liabilities (CL)		>1

The Applicant shall provide copies of the balance sheets and/or financial statements for last 3 years that:
(a) reflect the financial situation of the Applicant or partner to a JV, and not sister or parent companies.
(b) be audited by a certified accountant.
(c) be complete, including all notes to the financial statements.
(d) correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

☐ Attached are copies of financial statements (balance sheets, including all related notes, and income statements) for the 3 years required above; and complying with the requirements.

F. Safety:

The Applicant shall provide copies of all safety records (including incident records), and attendance to safety training programs.

I undersigned, certify that I am the designated legal representative of this Company, that the information provided above is correct and I am aware of the fact that I will be held responsible for providing false information.
I declare and certify that the information above is true and accurate to the best of my knowledge. I understand and accept any false or inaccurate information may result in the cancellation of any offer made by the Bidder, even if discovered later.

Name _____   Position: _____

Signature & Stamp: _____   Date: _____

BIDDER'S ETHICAL DECLARATION

<u>Date</u>:

<u>Tender N°</u>:   **T/10CFD/T12/ISI/LANDFILL_WORK/ERB/07032017/001**

<u>Bidder's name</u>:   _____

<u>Bidder's address</u>:   _____

<u>CODE OF CONDUCT:</u>

1. Labour Standards

The labour standards in this code are based on the conventions of the International Labour Organisation (ILO).

- *Employment is freely chosen*

There is no forced, bonded or involuntary prison labour. Workers are not required to lodge `deposits' or their identity papers with the employer and are free to leave their employer after reasonable notice.

- *Freedom of association and the right to collective bargaining are respected*

Workers, without distinction, have the right to join or form trade unions of their own choosing and to bargain collectively. The employer adopts an open attitude towards the legitimate activities of trade unions. Workers representatives are not discriminated against and have access to carry out their representative functions in the workplace. Where the right to freedom of association and collective bargaining is restricted under law, the employer facilitates, and does not hinder, the development of parallel means for independent and free association and bargaining.

- *Working conditions are safe and hygienic*

A safe and hygienic working environment shall be provided, bearing in mind the prevailing knowledge of the industry and of any specific hazards. Adequate steps shall be taken to prevent accidents and injury to health arising out of, associated with, or occurring in the course of work, by minimising, so far as is reasonably practicable, the causes of hazards inherent in the working environment. Workers shall receive regular and recorded health and safety training, and such training shall be repeated for new or reassigned workers. Access to clean toilet facilities and potable water and, if appropriate, sanitary facilities for food storage shall be provided. Accommodation, where provided, shall be clean, safe, and meet the basic needs of the workers. The company observing the standards shall assign responsibility for health and safety to a senior management representative.

- *Child Labour shall not be used*

There shall be no new recruitment of child labour. Companies shall develop or participate in and contribute to policies and programmes, which provide for the transition of any child found to be performing child labour to enable her/him to attend and remain in quality education until no longer a child. Children and young people under 18 years of age shall not be employed at night or in hazardous conditions. These policies and procedures shall conform to the provisions of the relevant International Labour Organisation (ILO) standards.

- *Living wages are paid*

Wages and benefits paid for a standard working week meet, at a minimum, national legal standards or industry benchmarks. In any event wages should always be high enough to meet basic needs and to provide some discretionary income. All workers shall be provided with written and understandable information about their employment conditions in respect to wages before they enter employment, and about the particulars of their wages for the pay period concerned each time that they are paid. Deductions from wages as a disciplinary measure shall not be permitted nor shall any deductions from wages not provided for by national law be permitted without the express and informed permission of the worker concerned. All disciplinary measures should be recorded.

- *Working hours are not excessive*

Working hours comply with national laws and benchmark industry standards, whichever affords greater protection. In any event, workers shall not on a regular basis be required to work in excess of the local legal working hours. Overtime shall be voluntary, shall not exceed local legal limits, shall not be demanded on a regular basis and shall always be compensated at a premium rate.

- *No discrimination is practised*

There is no discrimination in hiring, compensation, access to training, promotion, termination or retirement based on race, caste, national origin, religion, age, disability, gender, marital status, sexual orientation, union membership or political affiliation.

- *Regular employment is provided*

To every extent possible work performed must be on the basis of a recognised employment relationship established through national law and practice. Obligations to employees under labour or social security laws and regulations arising from the regular employment relationship shall not be avoided through the use of labour-only contracting, sub-contracting or home-working arrangements, or through apprenticeship schemes where there is no real intent to impart skills or provide regular employment, nor shall any such obligations be avoided through the excessive use of fixed-term contracts of employment.

- *No harsh or inhumane treatment is allowed*

Physical abuse or discipline, the threat of physical abuse, sexual or other harassment and verbal abuse or other forms of intimidation shall be prohibited.

B. Environmental Standards

Suppliers should as a minimum comply with all statutory and other legal requirements relating to the environmental impacts of their business. Detailed performance standards are a matter for suppliers, but should address at least the following:

- *Waste Management*

Waste is minimised and items recycled whenever this is practicable. Effective controls of waste in respect of ground, air, and water pollution are adopted. In the case of hazardous materials, emergency response plans are in place.

- *Packaging and Paper*

Undue and unnecessary use of materials is avoided, and recycled materials used whenever appropriate.

- *Conservation*

Processes and activities are monitored and modified as necessary to ensure that conservation of scarce resources, including water, flora and fauna and productive land in certain situations.

- *Energy Use*

All production and delivery processes, including the use of heating, ventilation, lighting, IT systems and transportation, are based on the need to maximise efficient energy use and to minimise harmful emissions.

- *Safety precautions for transport and cargo handling*

All transport and cargo handling processes are based on the need to maximise safety precautions and to minimise potential injuries to ACTED beneficiaries and staff as well as the suppliers' employees or those of its subcontractors.

C. Business Behaviour

The conduct of the supplier should not violate the basic rights of ACTED's beneficiaries.

The supplier should not be engaged
1.   in the manufacture of arms
2.   in the sale of arms to governments which systematically violate the human rights of their citizens; or where there is internal armed conflict or major tensions; or where the sale of arms may jeopardise regional peace and security.

D. ACTED procurement rules and regulations

Suppliers should comply with ACTED procurement rules and regulations outlines in ACTED Logistics Manual Version 1.2 or above. In particular, ACTED's procurement policy set out in Section 2.1 and 2.4. (contract awarding). By doing so, Suppliers acknowledge that they do not find themselves in any of the situations of exclusion as referred to under section 2.4.2.

Operating Principles

The implementation of the Code of Conduct will be a shared responsibility between ACTED and its suppliers, informed by a number of operating principles, which will be reviewed from time to time.

ACTED will:
1.   Assign responsibility for ensuring compliance with the Code of Conduct to a senior manager.
2.   Communicate its commitment to the Code of Conduct to employees, supporters and donors, as well as to all suppliers of goods and services.
3.   Make appropriate human and financial resources available to meet its stated commitments, including training and guidelines for relevant personnel.
4.   Provide guidance and reasonable non-financial support to suppliers who genuinely seek to promote and implement the Code standards in their own business and in the relevant supply chains, within available resources.
5.   Adopt appropriate methods and systems for monitoring and verifying the achievement of the standards.
6.   Seek to maximise the beneficial effect of the resources available, e.g. by collaborating with other NGOs, and by prioritising the most likely locations of non-compliance.

ACTED expects suppliers to:
1.   Accept responsibility for labour and environmental conditions under which products are made and services provided. This includes all work contracted or sub-contracted and that conducted by home or other out-workers.
2.   Assign responsibility for implementing the Code of Conduct to a senior manager.
3.   Make a written Statement of Intent regarding the company's policy in relation to the Code of Conduct and how it will be implemented, and communicate this to staff and suppliers as well as to ACTED.

Both parties will
1.   Require the immediate cessation of serious breaches of the Code and, where these persist, terminate the business relationship.
2.   Seek to ensure all employees are aware of their rights and involved in the decisions which affect them.
3.   Avoid discriminating against enterprises in developing countries.
4.   Recognise official regulation and inspection of workplace standards, and the interests of legitimate trades unions and other representative organisations.
5.   Seek arbitration in the case of unresolved disputes.

Qualifications to the Policy Statement

The humanitarian imperative is paramount. Where speed of deployment is essential in saving lives, ACTED will purchase necessary goods and services from the most appropriate available source.

ACTED can accept neither uncontrolled cost increases nor drops in quality. It accepts appropriate internal costs but will work with suppliers to achieve required ethical standards as far as possible at no increase in cost or decrease in quality.

E. Relation with Terrorism and Belligerent Forces

Bidder certifies that it has not provided and will not provide material support resources, information or any other means to any individual, association or organization that it knows, or has reason to know, is an individual or organization that advocates, plans, sponsors, engages in, or has engaged in an act of terrorism within Iraq or abroad. Bidders also commits to not support, advocate or assist any belligerent party that may affect ACTED alignement with humanitarian principles of impartiality and neutrality.

I undersigned _____, agree to adopt the above Code of Conduct and to commit to comply with the labour and environmental standards specified, both in my own company and those of my suppliers.

Name & Position of Bidder's authorized representative   _____

Authorized signature   _____

ACTED

KWASHE LANDFILL
LEACHATE TREATMENT PLANT

TECHNICAL SPECIFICATION
AND SUPPORT DOCUMENTS

FEBRUARY 2017

Canada

Table of contents

Table of contents 15

Executive Summary 17

1. Introduction 18

2. Kwashe Sanitary Landfill 19

3. Leachate Treatment Plant 26

4. Deliverables 31

5. Pre-qualification documentation... 33

6. Conclusions 35

Appendix A: Landfill survey points 36

List of Tables

List of Figures

List of Acronyms

BOD$_5$ – Biochemical oxygen demand (after 5 days)
CAPEX – Capital costs
COD – Chemical oxygen demand
ECB – Engineering Consulting Bureau from the University of Dohuk
GAC – Global Affairs Canada
GIZ – *Gesellschaft für Internationale Zusammenarbeit GmBH* (German International Cooperation Agency)
HDPE – High-Density Polyethylene
KRI – Kurdistan Region of Iraq
LTP – Leachate treatment Plant
MBR – Membrane Biological Reactor
MF – Microfiltration
NF – Nano-filtration
OPEX – Operational Costs
RO – Reverse Osmosis
TDS – Total Dissolved Solids
TSS – Total Suspended Solids
UF – Ultrafiltration
WWTP – Wastewater Treatment Plant

Executive Summary

ACTED, with funding from the Canadian Government (through Global Affairs Canada – GAC), has been mandated to improve community resilience in the wake of the ongoing conflict in Iraq.

In the scope of this project, ACTED shall build a leachate treatment facility at Kwashe landfill in Dohuk Governorate, Iraq Kurdistan, to improve the overall environmental sanitation of the site, and improve the capacity of the municipal authorities in terms of solid waste management.

Based on recent assessments, and extensive consultations with local stakeholders, it was concluded that the leachate treatment plant shall have a total treatment capacity of **3 m³/h** (or **72 m³/day**), as a design effluent flow. This capacity is sufficient to accommodate the current quantity of produced and accumulated leachate (including additional periods of high rainfall), and future landfill expansion.
The treated leachate from the plant will be discharged according to the local discharge quality standards, safe for irrigation and open ground discharge.

To make sure that the final effluent meets the required water quality standards for reuse and irrigation purposes, it is necessary to combine different treatment systems. The complete treatment process will include a sedimentation process, a **Membrane Biological Reactor (MBR)**, combined with either **Nano-filtration (NF)** or **Reverse Osmosis (RO)** as the primary, secondary and tertiary treatment processes respectively.

The dimensioning parameters for this leachate treatment plant (e.g. flow, mass load, concentrations), were determined after several stakeholder consultations, technical documentation review, and laboratory results from leachate samples.

As per ACTED's standard procurement process, an international invitation to bid, through pre-qualification for construction, will be launched. Additional information is provided on the "Appendix" section of this document, or upon request as defined in this pre-qualification process.

1. Introduction

In response to the on-going conflict in Iraq, ACTED is implementing an infrastructure project in the municipal landfill site in Dohuk governorate. ACTED intends to construct a wastewater treatment facility in the landfill to improve environmental sanitation through the treatment and more effective management of landfill leachate.

1.1. Introduction to ACTED

ACTED, a French NGO has been active in Iraq since 2003 providing humanitarian support to vulnerable populations through multi-sector emergency assistance. Through funding from the Canadian Government's agency for humanitarian and developmental assistance, Global Affairs Canada (GAC), ACTED is implementing a program titled "*Building resilience in most-affected communities in Iraq*", in the wake of the ongoing conflict in the region.

In the scope of this project, ACTED shall build a leachate treatment facility at Kwashe Landfill in Dohuk Governorate, Iraq Kurdistan, to improve the overall environmental sanitation of the site, and improve the capacity of the municipal authorities in terms of solid waste management.

1.2. Local Context

The situation in Iraq is complex and varies from region to region. The escalation of armed conflict across many governorates of Iraq has seen large influxes of Internally Displaced People (IDPs) throughout Iraq and neighbouring countries.

The autonomous region of Iraqi Kurdistan (KRI) has fared better than the rest of Iraq. Due to the ongoing conflict, Kurdish authorities have maintained an improved security environment and increased investment on infrastructures, in comparison to the rest of the country. The Dohuk Governorate, situated in the northern part of the Kurdistan Region of Iraq, has been a traditionally peaceful area, and despite the current neighbouring conflict, the security situation remains safe and stable.

This project is part of a wider programme that will ultimately help support communities and local authorities, throughout the Duhok Governorate, who have been severely affected by a large influx of displaced populations (IDPs) fleeing from the violence felt in South-central Iraq districts, since 2014.

According to the international community, these IDPs account approximately 1.8 million people, who are seeking refuge throughout the KRI. Currently, the Duhok Governorate is now hosting about 450,000 IDPs, in addition to over 90,000 Syrian refugees.

The great influx of displaced persons, coupled with the on-going neighbouring conflict, and the economic crisis (due to decreasing oil prices), has resulted in the degradation of several public services such as sanitation, access to water, waste management services, and others. Due to the above-mentioned situation, it is crucial to improve WASH services across the KRI region, for both displaced and host populations.

1.3. Program Outline

To mitigate the impact of conflict-related displacement crisis in the KRI, this program aims to enhance resilience in several affected communities around the Dohuk Governorate, and improve social cohesion through mitigating community-level tensions.

These eight communities will receive targeted WASH infrastructure investments, coupled with WASH-related capacity building to local authorities. These infrastructure investment activities will involve rehabilitating and extending water storage and distribution networks, as well as improving water availability and waste management services.

In parallel, small-scale investments will be made through community WASH-related infrastructure rehabilitation and awareness campaigns. These investments will help mitigate any possible tensions between the host and displaced populations, in the Duhok and Ninewa governorates.

In recent years, solid waste management services have been deteriorating due to the economic crisis and neighbouring conflict, and are increasingly deteriorating. Local authorities have been advocating that solid waste support be a priority for responding organisations. As such, ACTED intends to implement targeted infrastructure development for the municipal sanitary landfill, with an intention of improving the environmental sanitation situation in Dohuk governorate. Ultimately, this will enable local authorities to improve solid waste service delivery and alleviate adverse impacts of the IDP influx into the region.

2. Kwashe Sanitary Landfill

Kwashe sanitary landfill in Dohuk Governorate is the only formal facility that provides some degree of solid waste processing for the entire governorate. The population influx since 2014 has placed additional burden on the landfill, and increased the negative environmental effects of its current configuration. The Municipality is the government agency responsible for solid waste service provision.

The landfill is located near the area of Kwashe, which is a mix of industrial and residential zoning. Kwashe is located in the district of Summel, and is approximately 20km northwest of the capital of the governorate, Dohuk city. The coordinates of the landfill are *36.9745N* and *42.8088E*, with the location indicated in Figure 1 below.

Figure 1: Location of Kwashe Landfill

Since the landfill was first constructed (in 2012), several investments have been made, including a waste sorting plant and a leachate pond.
Investment in Kwashe landfill has been incremental since the landfill was first constructed, in that not all elements of the landfill – such as a leachate treatment plant – were included in the initial construction. However, due to the on-going neighbouring conflict and current economic situation, further investment has been delayed resulting in considerable environmental pollution due to unmanaged leachate management.

2.1 Landfill Overview

The Directorate General of Municipalities of Dohuk Governorate, and other relevant government agencies, have indicated that investment in the landfill is a key priority in the region.
The current site, inaugurated in 2012, consisted in a waste sorting facility with a full working capacity of 320 tons of waste per day (which represents 40% of the total waste received, 800 ton/day).
In 2014, further investment was made in the construction of a sanitary landfill cell; the landfill cell included the construction of a buffer tank (V=3,000 m^3) to store any possible leachate.
In the present days, this landfill needs additional facilities to improve solid waste management on the site. One of the major priorities is the construction of a leachate treatment plant (LTP), to treat and safely discharge all liquid emissions coming from the landfill cell (and sorting station), without causing harm to the environment. The layout of the landfill is shown in the figure below (Figure 2). The AutoCAD file containing all the specific drawings regarding the Kwashe Landfill site is also available upon request.
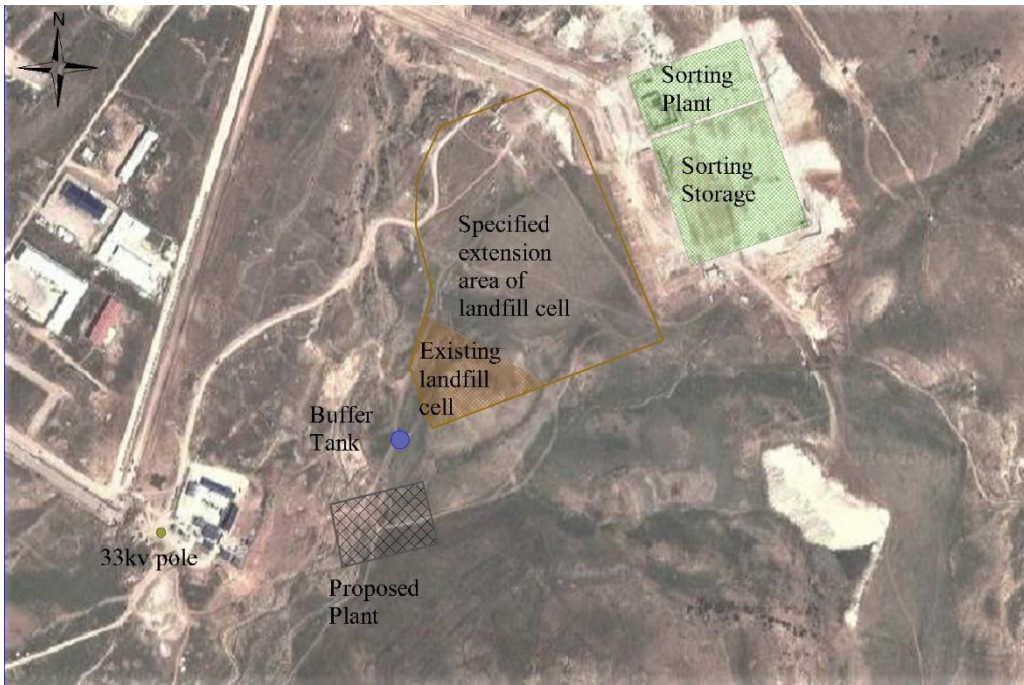
Figure 2: Current layout of Kwashe sanitary landfill

Some important facts about the Kwashe landfill site:
- Existing cells: 25,000 m^2
- Specified area for future cell extension: 120 000 m^2
- Optimal capacity: 800-1,000 ton/day

In total, the Kwashe landfill site receives approximately 800 tons of municipal solid waste per day, coming from the two major cities within the Duhok Governorate: Duhok (the capital) and Summel.

The sorting plant at Kwashe landfill consists of two lines, each with the capacity to sort 500 tons per day, but currently the total waste sorting capacity is about **800 ton/day**. The sorting plant separates metals, plastics, organics, paper-based materials, rubbers and glasses. The organic materials are processed within the plant, in a composting station.

The sorting plant should have the capacity to sort **60% of the total waste**, and the remaining 40% (unusable waste) should to go in to the landfill cells, according to landfill manager. These estimated values can should only be used considered for information purposes only, but it will not impact the design of the leachate treatment plant, as the proposed project is focusing focuses on other parameters such as leachate production (flow), leachate chemical characteristics and total rainfall.

Since there are no recycling capabilities within the sorting facility, the sorted materials (including the compost) are then stored and sold for a profit. The remaining non-recyclable waste, approximately **320 ton/day**, is then deposited into the landfill cell.

The existing sanitary landfill cell has a total area of **25,000 m^2** and **3 m** deep, as shown in the figure below (Figure 3). It is comprised of compacted clay covered by an impermeable geo-membrane layer of high-density polyethylene (HDPE) sheet. The geo-membrane is covered by a layer of gravel, which acts as a filter between the solid waste and any generated leachate. A drainage system between the impermeable layer and gravel collects all the leachate from the cell, and diverts the leachate by gravity into a reinforced concrete leachate buffer tank.

Currently, there is no cover over the cell, to prevent additional leachate formation from precipitation. As a result, the existing buffer tank overflows during the wet season (winter), dumping leachate into the open ground.

Figure 3: The current landfill cell at Kwashe

As seen on the figure above (Figure 3), there is an open area of approximately **120,000 m²** between the existing landfill cell and the sorting plant; this area is currently undeveloped, and is reserved for future cells expansion, once the active cell is full.

The current active landfill cell is approximately three quarters full, and is anticipated to have sufficient capacity for another year, after which a depth extension of the existing active cell will follow. This will eventually be followed by the construction of a new landfill cell as required.

The buffer tank lies downhill of the landfill cell, and therefore the leachate flows directly through the drainage systems by gravity, without requiring the use of pumps. The buffer tank has a **diameter of 30 m**, and is **4 m** deep, giving an approximate volume of **3,000 m³**.

As there are not yet any leachate treatment capabilities, the buffer tank has been overflowing since 2014 and leachate is being discarded onto the open ground adjacent to the tank. The leachate buffer tank can be seen in the figure below (Figure 4).

Figure 4: Leachate buffer tank

Near to the landfill, there is an industrial area that are supplied with **33 kV** electrical lines. The designated point for electrical extension for the leachate treatment plant is indicated in the Figure 2 (in the previous page).

Due to load shedding, power supply in the KRI is irregular, with an average of **16 hours per day of electricity** supplied. In addition, there are no sewerage networks in the vicinity of landfill.

2.2 Leachate Quantity

The weather in Dohuk is quite variable throughout the year. During the winter, it is quite wet, and temperatures may drop below zero. The summer is generally dry, with low or zero precipitation periods (monthly average precipitation of the dry season, May-Oct), and temperatures soaring up to 45 degrees Celsius.
Therefore it is fair to assume that the maximum and minimum leachate generation occur during the winter and summer periods, respectively.

2.2.1 Dry season:

The leachate flow was calculated for the dry season (May to October), taking into consideration the following assumptions:

- Leachate generated from the current landfill cell (25,000 m^2),and as well as from the 6 future cells;
- Leachate generated from both sorting and composting plants. These two flows are combined into a single manhole, and transported to the buffer tank so it can be treated.
- For mass load calculation, the summer flow will be assumed as **1.7 m3/h** as the maximum expected flow.

2.2.2 Wet season (winter):

As referred above, the winter in the Dohuk Governorate is relatively wet. Based on the information provided by the Duhok Directorate of Agriculture and the Duhok Meteorological Bureau, the months of heavy rainfall are between **November and March** (January being the wettest month), where the monthly average rainfall is **459 mm**, and the annual average rainfall is approximately **730 mm**.

A preliminary assessment carried out ACTED WASH team, revealed that the **maximum leachate produced** during the winter period was approximately **3 m³/h**, taking in consideration the following assumptions:

- The total catchment area for the first cell is **25,000 m²** (when it will be full);
- The pre-closure leachate generation rate (Lv) was calculated using the **Water Balance method**, taking in consideration the average monthly rainfall data, average monthly evaporation data, and 25,000 m² of the cell catchment area.
- Runoff is 10% of total precipitation, due to the poor condition of the landfill
- The leachate produced by the waste itself was calculated, taking in consideration the amount of waste sent to the landfill cell (approximately 40% of the total waste received, or **320 ton/day**), and a leachate conversion ratio of **16%** (according to the literature);
- The volume calculated for the buffer tank considered the maximum precipitation and minimum evaporation levels (i.e. "worst case scenario" situation).

After the calculations, these <u>preliminary results</u> show that a **new buffer tank** with a capacity of **4,000 m³**, would be sufficient to accommodate the production of extra leachate, without ever overflowing, even during extreme weather events (e.g. heavy rainfalls). Therefore, the total tank capacity would be **7,000 m³** (3,000 m³ on the existing tank, and 4,000 m³ for the new one).

Important notes:
1) This is a preliminary assessment carried out by the ACTED WASH team. The bidders should be able to provide accurate results, showcasing their assumptions and calculations;
2) The volume assessed above uses monthly rainfall and evaporation averages, where it would be better to use daily (or even hourly precipitation values). However, to overcome this problem, a **leachate recirculation system** (from the buffer tank to the sanitary cells) should be implemented and volume re-calculated by the bidder, knowing that the maximum rainfall intensity is **36 mm/h** for Kwashe landfill.

2.3 Leachate Quality

In general terms it is difficult to predict the overall quality of the leachate produced in a domestic waste landfill, due to the great variety of waste deposited into the cells. The ACTED WASH team have conducted several preliminary water quality tests, with the collaboration of the Directorate of Environment.
Several leachate sources have different qualities, as follows:

1. **Buffer tank**: The leachate accumulated in the 3,000 m³ tank has been accumulated, through the percolation and rainfall on the cell. This leachate has a colour range from brown to semi-black colour, as shown in the following figure:

Figure 5. Existing leachate buffer tank (V=3,000m³)

Several samples of this leachate have been taken by the ACTED team in the last months, and are available upon request. This effluent has low value parameters, when compared to the other sources of leachate, due mainly to dilution from rainfall and sedimentation.

2. **Cell drain**: This leachate is generated from the waste rest that has been dumped into the cell. During the summer, it has very high concentrations of pollutants, hence having a slightly darker colour than other leachate effluents (as seen below).

Figure 6. Leachate coming from the landfill cell drain

3. **Sorting and composting plants**: In the waste processing plant, there are two different sources of leachate, one from the waste sorting plant and the other from the composting station (for the organic fraction). Both of this effluents are combined into a single manhole, and, when mixed, have a semi green colour (as shown below).

Figure 7. Sample of leachate from Sorting and Composting plants (combined)

Given the different sources of leachate (both in terms of quantity and quality), when combined in the buffer tank, these may result in different inflow concentrations.

Based on the above-mentioned information, the design of the Leachate Treatment Plant (LTP) shall be considered for a maximum capacity of 3 m³/h (or 72 m³/day as final plant effluent), which consist of two main parts:

1) **Design flow calculations**: 3 m³/h based on the above-mentioned information;
2) **Design mass load calculations**: Since the majority of the 3m³/h is originated mostly from rainfall, the produced leachate is very diluted. This may result in over-dimensioning the solid-phase stages of the treatment processes (which also will increase the total cost of the project). Therefore, it is advisable to consider a smaller flow (approximately **1.7 m³/h**) for the summer period, for the current (and future) cells, sorting plant and composting station altogether. The load calculations must be assumed using the following table below (**Error! Reference source not found.**):

Parameter	unit	Value
pH	#	7.5-9
COD	mg/L	11,000
BOD_5	mg/L	5,000
TSS	mg/L	700
Conductivity	mg/L	20,000
NH_3	mg/L	1,350
NH_4	mg/L	1,350
NO_3	mg/L	1,500
PO_4	mg/L	20
SO_4	mg/L	1,000

Important notes:
1. All bidders must use the flow (1.7 m^3/h) with the concentrations in **Error! Reference source not found.**, for Mass Load (kg pollution /day) calculations;

2. However the plant must have the capacity to treat 3 m^3/h as the design final plant effluent, assuming that the mass loads in winter will not exceed the summer one;

3. The supplier should take the necessary additional samples as possible, to ensure a correct dimensioning of the LTP, in order to increase the relevancy of the data, and to finalize the design specifications of the plant, as mentioned in item #1 of *Section 4.1*.

4. The high-seasonal variance of leachate concentrations can be partially attributed to seasonal and climatic changes, and also to uncertainties in the measurements, due to the limited testing capabilities available locally;

5. It is planned that the facility be **operational 24/7**, as to reduce capital costs, with mechanical equipment operating on cycles.

3. Leachate Treatment Plant

As the Kwashe landfill facility lacks a leachate management and treatment system, there is on-going environmental pollution. The implementation of a leachate treatment facility is therefore crucial to the continued development of the solid waste management infrastructure of Dohuk government.

The leachate treatment system should be capable of treating all produced landfill leachate to a standard that reduces the detrimental environmental effects that currently occur as a result of the leachate overflowing onto surrounding land.

There are a variety of established treatment processes for landfill leachate. However, the suitability of these processes varies based on the leachate test parameters and the local context. ACTED envisages the implementation of an appropriately designed leachate treatment facility, tailored for the KRI.

3.1 Discharge Limits

Iraq has defined standards regarding protection of water systems in the KRI. The discharge standard for reuse for irrigation has been identified as the most appropriate target.

Error! Reference source not found. lists the KRI standards for wastewater discharge for irrigation use as stipulated by the Council of Ministers and according to the provisions of the:

- *Third subsection of Article 80 of the constitution*;
- *First paragraph of Article 38 of the Protection and Improvement of the Environment Law No. 27 of the year 2009*; and
- *National Determinants for the use of Treated Water for Agricultural Irrigation Law No. 3 of the year 2012.*

The aim is to design a process able to treat the leachate for the "*worst case scenario*" possible (i.e. extremely high leachate concentrations, variable flow, extreme rainfalls), and **respect the KRI discharge limits** listed in the following table (see **Error! Reference source not found.** below).

Table 2: Permissible KRI wastewater discharge standards for irrigation reuse

Parameter	Unit	Maximum Permissible Value
Physical Parameters		
pH	-	5-8
Colour	-	No colour (in a 1:10 dilution)
Total Suspended Solids (TSS)	mg/L	40
Total Dissolved Solids (TDS)	mg/L	2,500
Organic and Inorganic Parameters		
Biochemical Oxygen Demand (BOD5)	mg/L	40
Chemical Oxygen Demand (COD)	mg/L	100
Nitrate (NO3)	mg/L	50
Ammonium (NH4)	mg/L	5
phosphate(PO4)	mg/L	25
Metals / Cations / Anions		
Aluminium (Al)	mg/L	5
Arsenic (As)	mg/L	0.1
Beryllium (Be)	mg/L	0.1
Boron (B)	mg/L	0.75
Cadmium (Cd)	mg/L	0.01
Calcium (Ca)	mg/L	450
Chromium (Cr)	mg/L	0.1
Cobalt (Co)	mg/L	0.05
Copper (Cu)	mg/L	0.2
Fluorine (F)	mg/L	1
Iron (Fe)	mg/L	5
Lead (Pb)	mg/L	0.1
Lithium (Li)	mg/L	2.5
Magnesium (Mg)	mg/L	80
Potassium (K)	mg/L	100
Manganese (Mn)	mg/L	0.2
Mercury (Hg)	mg/L	0.001
Molybdenum (Mo)	mg/L	0.01
Nickel (Ni)	mg/L	0.2
Selenium (Se)	mg/L	0.02
Vanadium (V)	mg/L	0.1
Sodium (Na)	mg/L	250
Zinc (Zn)	mg/L	2
Solvents, Alcohols and Others		
Phenols	mg/L	0.002
Chlorine (free)	mg/L	0.5
E. Coli TCC	MPN/100mL	1,000
Sodium adsorption ratio (SAR)	mg/L	6-9

Unreachable parameters using both of the anticipated processes (either MBR+RO or MBR+NF), must be clearly highlighted as well as influent / effluent simulation. The bidders must submit the Influent/effluent simulation as mentioned in Section 5 of this document ("*Prequalification documentation*").

3.2 Design Considerations

Based on discussions conducted with key stakeholders, the following criteria have been determined as key considerations for the selection of an appropriate leachate treatment concept:

- **Modular design**: The rate of leachate production will greatly (include numbers) vary over time due to climate/seasonal changes, and as the landfill cell increases due to population growth and future consequent landfill expansion. Therefore, the system should be easily expandable for the flow (e.g. using modular tanks, or parallel systems), also a highly noticeable variation of concentrations were found, indicating that the leachate age varies from "young" to "old".
- **Cost-efficient**: At the moment, the KRI government currently faces an economic crisis. Whilst the capital costs shall be borne entirely by ACTED, the operational and maintenance costs must be minimal in order to ensure financial sustainability of operations during this period, without ever compromising the efficiency of the operation.
- **Improved Operator capacity**: As there are no current publicly-owned leachate treatment facilities throughout the KRI, there is no institutional capacity or previous experience in the operation and maintenance of such facilities. Whilst the provision of specialised training is envisaged, the operation and maintenance should be commensurate to the level of local expertise.
- **High degree of automation**: To minimise operation costs, the municipality has indicated a preference for increased automation, and potentially a degree of remote monitoring or operation, for the LTP. This would also enable additional external support to be provided, after plant handover.
- **Ensure effluent quality**: Leachate parameters are variable, especially due to seasonal or climatic changes. Furthermore, concentrations of leachate parameters will also change along with the aging of the landfill (young, medium age, old). The treatment facility should therefore have the capacity to adequately treat leachate of varying quality.
- **Delimitation of the area:** Despite having sufficient government-owned land available in vicinity of the landfill, and having some industries nearby, there is a residential village close to this area. T therefore, proper delimitation of these areas must be undertaken to ensure that noise, air and odour pollution are minimized to avoid any contact with the population.
- **Constant water and energy supply**: Currently, there are municipal water and electricity sources accessible in the proposed location. There are no serious water shortages in the KRI, and therefore conservation and reuse of effluent is not a priority. However, electricity supply is intermittent, and therefore a generator would be required for the continuous operation of the LTP. The costs associated to the operation of the generator shall be borne by the municipality, whilst electricity from the grid will not. The entire electrical system of the facility should also have a built-in system for surge protection.
- **Climate adaptation**: The KRI can endure extremely hot and dry summers, as well as very cold and wet winters. The technology should be able to operate in the variety of climatic conditions expected in Dohuk.
- **Material availability**: Whilst construction will be contracted internationally, spare parts or consumable materials should be available locally as a first preference, or easily procurable internationally otherwise.

3.3 Anticipated Design

The preliminary design of the leachate treatment facility for Kwashe landfill will involve sedimentation, MBR and either RO or NF as the primary, secondary and tertiary treatment processes respectively.
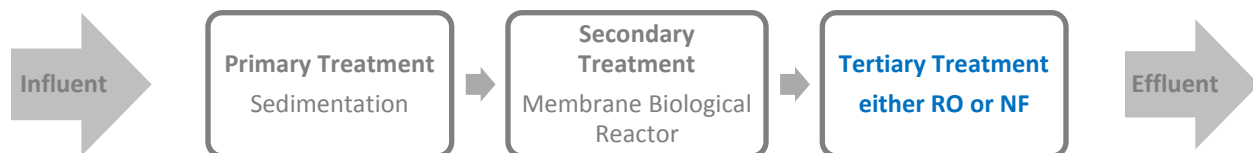
The leachate treatment process should consist of several steps:

1) **Buffer tank**: A new buffer tank with 4,000 m^3 of capacity will be constructed, to complement the pre-existing 3,000 m^3 circular concrete tank, and collect all the produced leachate from the landfill cell. These two tanks must have sufficient volume to intake all the produced leachate from the cell, especially during winter, at a constant treatment rate, without overflowing

2) **Recirculation system**: The calculation of the generated leachate during winter is based on the yearly average rainfall (**458 mm**). This does not consider the high rainfall intensity (daily and hourly), therefore a recirculation system needs to be installed in order to prevent the generated leachate to overflow in the time of high rainfall intensity, knowing that the maximum rainfall intensity is **36 mm/h** for Kwashe.

3) **Equalisation tank**: The equalisation tank should regulate variations in influent flow and concentrations using a mixing process. Subsequently, the leachate will be pumped through a mechanical screen to remove any large solids;

4) **Primary sedimentation tank**: The sedimentation tank will reduce the concentration of some parameters through a sedimentation process. Scrapers will be installed at the base of the tank for desludging, with excess sludge transported to the cell.

5) **Membrane biological reactor (MBR)**: The MBR treatment will consist of the following treatment chambers:
   - an anoxic de-nitrification zone;
   - an aerobic nitrification zone;
   - Membrane treatment process: **ultra-filtration (UF)** to separate the activated sludge/biomass from the permeate. A **side-stream** configuration should be used (tubular type).
   - Apart from the general upkeep of the equipment, the main maintenance required is the cleaning of the membrane module. During operation, the membrane should be physically and chemically cleaned (through an automatic backflushing mechanism), for safety and reliability.

6) **Tertiary/advanced treatment**:
   - Either Reverse Osmosis (RO): The Reverse Osmosis is considered semi-permeable membranes removes the organic matter, mineral content and heavy metals as well, membranes feed by effluent water from the MBR process. The remaining concentration brine from RO will be pumped to the cell.
   - Or Nano-filtration (NF): Nano-filtration refers to a speciality membrane process which rejects particles in the approximate size range of 1 nanometer (10 Angstroms), the remaining concentration brine from this process will be pumped to the cell.
   - For both these options, both RO and NF, shall use a **spiral wound Module**.

Additional considerations for the LTP:

1. **Pump operation**: Ideally the leachate should be **transported by gravity** as much as possible throughout the LTP, as to reduce the operational costs. If it is not possible to transport the leachate by gravity, for specific sections of the LTP, pumps should operate between cycles, and there should be at least one in standby. In this situation, a **minimum of two pumps** would be required at **each stage**. However, bidders are encouraged to propose an alternative pumping system, clearly indicating the duty pumps and the stand-by pumps, and explain the design by financial and technical justifications.

2. **Other mechanical equipment**: The cost of all mechanical equipment and associated, or required, electrical equipment (including pipework to connect the respective stages) should form part of the design.

3. **Location of the construction site**: The proposed site for the construction of the leachate treatment plant, as previously indicated in Figure 2, is shown in Figure 8 below. A topographic survey has been carried out for this area, with the exact coordinates published in the Appendix section of this document (Appendix A). Additionally, a CAD file containing the surveying points will be supplied as part of the overall package.

Figure 8: Proposed area for leachate treatment plant including RO or NF

- **Automation**: The entire LTP should be highly automated using SCADA ("*Supervisory Control and Data Acquisition*"). The treatment process should be controlled automatically via PLC (Programmable Logic Controllers) and an operator panel. The process will be presented on a series of process-flow diagram screens, which will show the following information, such as, for example:
  - Process variables (e.g. flow, pressure, temperature, pH, in accordance with the instrumentation located in the field);
  - Valves, on or off;
  - Pumps, on or off;
  - Alarms;
  - Process trend data;
  - The plant will be controlled via computer facility.

The entire treatment process will be managed from a site-based control room, with one operator responsible for monitoring the system and ensuring a smooth operation. The plant will be operated continuously, and therefore staffed 24/7. A remote monitoring module will also be set up, to allow for the construction company to provide continued off-site diagnostics and process improvement support after handover.

3.4 Sampling

The Contractor shall provide an automatic portable sampling device for the LTP to sample raw and treated wastewater for the analysis, since the beginning of the project. This shall become the property of ACTED by the end of the project. The Contractor's detailed design shall allow automatic sampling possibilities, and equipment at the following locations as a minimum:

- At the inlet to the Leachate Treatment Plant.
- At the final outlet of the Leachate Treatment Plant.
- At least on further intermediate location as approved by the ACTED Engineer.

Important notes:
- The Contractor shall ensure that samples are properly refrigerated before the laboratory analysis.
- The Contractor shall ensure that the extraction of any samples (at the designated sampling points) at the Leachate Treatment Plant can be done safely;
- During operation of the LTP, the contractor shall also make sure that samples can be taken between the different treatment units.

4. Deliverables

4.1 Bill of quantities for anticipated procurement and construction activities

Based on the anticipated design, suitable companies will be expected to procure and implement the following items. The activity must be completed **within 6 months** from the date of contract signature.

item	Description
1	**Additional Design** Additional primary data collection including site surveying, leachate testing, soil testing, etc. Other context specific design or secondary research Preparation of a detailed final design for implementation including all associated documentation Preparation of a detailed environmental management plan
2	**Site Works** Cleaning and levelling of site Construction of temporary or permanent site facilities, e.g. office, pump house, storage room, etc. Fence enclosure for plant , and any access roads or pathways
3	**Buffer Tank** Modifications to pre-existing buffer tank (3,000 m^3) for leachate treatment plant Construction of new concrete buffer tank with volume of 4,000 m^3 Pump, and required mechanical and electrical accessories
4	**Recirculation system** Design and install a recirculation system on the buffer tank including all required mechanical and electrical accessories (pumps, pipes, sensors, etc.), knowing that the maximum rainfall intensity is 36 mm/h for Kwashe landfill. The recirculation system will pump the leachate from the buffer tanks to the cell during high rainfall intensity so it will prevent any leachate overflow
5	**Equalisation Tank** Site preparation including excavation, filling, compaction, sub-base, etc. Concrete works including finishing, manholes, ladders, etc. Pumps, blowers, and diffusers; and required mechanical and electrical accessories Mechanical screen filter, and required accessories
6	**Primary Sedimentation Tank** Site preparation including excavation, filling, compaction, sub-base, etc. Concrete works including finishing, manholes, ladders, etc. Pumps and scrapers; and required mechanical and electrical accessories
7	**Membrane Biological Reactor** Site preparation including excavation, filling, compaction, sub-base, etc. Concrete works including finishing, manholes, ladders, etc. Pumps and blowers; and required mechanical and electrical accessories Side-stream membrane unit, and required accessories and sensors
8 NF	**Nano-filtration** Supply and install a complete NF system with all the required accessories. All required mechanical and electrical accessories
8 RO	**Reverse Osmosis** Supply and install a complete RO system with all the required accessories. All required mechanical and electrical accessories
9	**Electrical Works** SCADA system, including all instrumentation, and other required software and hardware Standby diesel generator for operation of entire plant, including fuel tank Connection to mains transmission line including transformer, poles, auto transfer switch, etc. Main and sub-main distribution boards, and required accessories Lighting, and other domestic electrical accessories, e.g. sockets, air-conditioning, etc.
10	**Training and Handover** Start up and commissioning, including provision of all engineering documentation Three months on-site in-country training and support Nine months remote monitoring and support One year process guarantee One year warranty support for all mechanical parts One year supply of consumables and spare parts
11	**Any other costs** not previously mentioned

4.2 Environmental management and monitoring plan (EMMP)

ACTED and GAC agreement regarding project implementation is to ensure that projects and associated construction activities will not negatively impact the environment. Therefore ACTED prepared an environmental management and monitoring plan (EMMP) to follow up construction activities as well as listing out environmental-friendly operation and maintenance activities.

However, due to the high technicality of the leachate treatment plant, ACTED will also request the contractor to provide its own EMMP for the implementation of the project (construction phase). This will ensure that the selected company is already used to work under clear construction guidelines to reduce environmental impacts.

Part of contractor EMMP will also include standard operation procedures (SOP) for the daily running of the plant including environmental mitigation measures. This will be part of the handover process to the local authorities.

The EMMP will include impacts such as air, water and soil pollution, with a clear description of the mitigation measures, indicating the stakeholders responsible of applying those measures (e.g. contractor) as well as how it will be monitored:

| Impact type | → | Description of the mitigation measures (MM) | → | Responsible of applying MM | → | ACTED Monitoring activities | → | Data collection and reporting frequency |

ACTED site engineers will ensure that mitigation measures are properly taken. Site engineers will visit the site on a daily basis, and record all mitigation measures - whether undertaken or outstanding – and any other environmental concerns, as part of ACTED monitoring activities. Information will be recorded on the daily site reporting form which contains a section for construction activities as well as another section specifically for environmental mitigation measures.

4.3 Handover process

After completion of construction and commissioning, a three-month handover period is envisaged during which company personnel remain on-site to provide tailored training and knowledge transfer for municipality staff. The company personnel will also be responsible for addressing any start-up operation or maintenance issues with the plant. Following this period, a nine-month period of remote monitoring support will also be included as to ensure sustainability of operations. All engineering documentation will be provided to ACTED and the municipality for operation and maintenance purposes, as well as for the future plant expansion.

Given the economic situation of the municipality and the difficulty of importing parts into the KRI, bidders are requested to include a one year supply of consumable materials required operate the plant. Bidders are also requested to supply of spare parts envisaged for short-term maintenance for a period of approximately one year after commissioning. A minimum of one-year warranty for all plant equipment and treatment process guarantee will also be mandatory.

Future municipal investment priorities for the landfill will include the construction of an additional landfill cell, followed by an onsite recycling facility, and eventually a scheme to manage the leachate production and closing of the open dumping area.

5. Pre-qualification documentation

All pre-qualified suppliers must include the following documents, as a minimum standard:

1. **Company information**, expertise and list of past industrial wastewater projects (as stipulated in the invitation to prequalify);

2. **ID of legal representative;**

3. **Bill of Quantities**: The information presented in the attached technical specification on the design of the leachate treatment plant and its associated bill of quantities shall be considered as a baseline at this stage and subject to adjustments on the second stage of this tender. Bidders should submit **detailed bill of quantities** based on these information and proposed treatment stages. If other solutions are suggested, bidders will clearly justify their alternative bill of quantities. (see section 4.1)

4. **Design proposal** including:
   a) Influent/effluent simulation (concentrations, mass loads),
   b) Plant sizing,
   c) **O&M costs (monthly and yearly costs)**: Complete breakdown of the total Operation & Maintenance (O&M) costs for the LTP: chemical materials, wear and tear parts, spare parts, energy costs, assuming (0.15 USD/kW for the energy costs).
   d) Performance specification including Process Flow Diagram (PFD), Max flow (during peaks) and electricity consumption (kWh/m^3).
   e) Supervisory control and data acquisition (SCADA), components and properties
   f) Other relevant design information

5. MBR Technical specifications:
   a) Membrane type, brand, model number (with detailed documentation to be provided)
   b) Number of membrane.
   c) Membrane area (per membrane, and total)
   d) Aeration method (jet aerator, diffuser, floating surface aerator, etc.)
   e) Design Flux: Influent/effluent flow for MBR (m^3/h)
   f) Guaranteed membrane life when operating under the conditions specified in the tender
   g) Specifications for other major components (blowers, sensors, pumps, valves, PLC, etc.)

6. **OPTION #1**: Reverse Osmosis technical specifications **in (MBR +RO) process:**
   a) Membrane type, configuration, brand, model number (with detailed documentation to be provided)
   b) Number of membrane modules.
   c) Membrane area (per membrane, and total)
   d) Flux (day average, Max), Recovery rate (r %) max and min, inlet pressure of feed stream (kPa).
   e) Guaranteed membrane life when operating under the conditions specified in the tender.
   f) Total operation cost (USD $/m^3) for RO including all costs with a breakdown assuming 0.15 USD/kW for the energy cost.

7. **OPTION #2**: Nano-filtration technical specifications **in (MBR +NF) process:**
   a) Membrane type, configuration, brand, model number (with detailed documentation to be provided)
   b) Number of membrane modules.
   c) Membrane area (per membrane, and total)
   d) Flux (day average, Max), Recovery rate (r %) max and min, inlet pressure of feed stream (Kpa).
   e) Guaranteed membrane life when operating under the conditions specified in the tender.
   f) Total operation cost (USD $/m^3) for NF, including all costs with a breakdown assuming 0.15 USD/kW for the energy cost.

8. **Running (O&M) costs** (supply of spare parts and consumables):
   a) Cost of replacement membrane/s
   b) List and cost of chemicals required for running the complete plant over the period of a year (this includes the chemicals for periodic membrane cleaning)
   c) List and cost of spare parts required as preventive maintenance over a year
   d) Labour hours needed for preventive maintenance over a year

9. **Implementation strategy**; including consideration of location, local context and certification to operate in Kurdistan Iraq

10. Proposal for **training and handover** (see Section 4.3) to ensure plant sustainability, including after-sales service and support

11. **Schedule of all construction activities**, material lead times, installation and other relevant activities, assuming an arbitrary starting date (using a *Gantt Chart*, **with a weekly scale**)

All pre-qualified suppliers will be contacted, and requested to provide the following additional documents:

6. Detailed specifications for all plant processes (P&ID); and major parts, equipment and materials
7. **Bill of quantities**: Detailed cost breakdown including unit costs and separated by equipment, service, fees, etc.
8. Detailed implementation plan including procurement, construction, handover, etc.
9. List of proposed locally engaged companies or organisations, including responsibilities and local certification(s)
10. Environmental management and health and safety plan for construction and operational phases (Section 4.2)

6. Conclusions

ACTED, with funding from GAC, has been engaged to implement a leachate treatment facility in Kwashe landfill. This project will improve solid waste management and environmental sanitation in Dohuk Governorate.

A preliminary site and concept investigation has been conducted by ACTED. Based on these findings, ACTED proposes membrane biological reactor as the treatment process, supplemented by sedimentation and bio-filtration. ACTED is now seeking to engage a wastewater treatment company to provide a final design and construction for the leachate treatment plant.

The leachate treatment plant should have nominal capacity of **3 m³/h** (or **72 m³/day**) as the final plant effluent, and treat the leachate to the KRI reuse for irrigation discharge standards. Design considerations to ensure appropriateness for the local context have been developed in conjunction with local stakeholders; this is complemented by a comprehensive handover and after sales support to ensure sustainability.

Name & Position of Bidder's authorized representative   _____

Authorized signature   _____

Appendix A: Landfill survey points

Point	Easting	Northing	Elevation, m	Point	Easting	Northing	Elevation, m
"B1"	305650.778	4095158.249	500.4747	"p58"	305546.844	4094935.479	503.2577
"Man"	305630.518	4095139.195	496.5907	"p59"	305536.825	4094921.964	504.8117
"FE1"	305631.796	4095116.857	497.3167	"p60"	305536.241	4094924.137	503.9227
"FE2"	305596.016	4095112.638	494.4667	"p61"	305542.919	4094947.438	501.0607
"FE3"	305579.115	4095120.234	494.2727	"p62"	305533.843	4094937.966	501.5647
"FE4"	305570.791	4095133.691	494.2977	"p63"	305539.93	4094955.739	499.9557
"FE5"	305569.265	4095138.051	494.3147	"p64"	305532.316	4094948.311	500.1207
"FE6"	305569.353	4095152.83	494.6767	"p65"	305537.099	4094964.25	499.1357
"p1"	305582.563	4095117.679	494.3277	"p66"	305528.112	4094962.89	498.5897
"p2"	305571.346	4095125.662	493.8917	"p67"	305536.247	4094966.723	498.8827
"p3"	305578.745	4095107.481	493.2877	"p68"	305535.593	4094968.753	498.1627
"p4"	305564.437	4095114.963	492.8837	"p69"	305525.676	4094965.05	497.6457
"p5"	305573.189	4095098.961	492.8227	"p70"	305532.384	4094980.815	496.3467
"p6"	305559.598	4095104.64	492.4807	"p71"	305523.301	4094979.274	495.6987
"p7"	305572.356	4095095.673	492.8087	"p72"	305530.929	4094994.984	494.7057
"p8"	305570.66	4095091.765	493.4007	"p73"	305522.971	4094994.919	494.1947
"p9"	305573.445	4095093.844	493.7667	"p74"	305530.005	4095005.187	493.6657
"p10"	305575.019	4095096.484	493.5247	"p75"	305522.772	4095006.601	493.1417
"p11"	305579.058	4095101.814	494.3287	"p76"	305524.803	4095008.013	492.9877
"p12"	305580.986	4095104.054	493.7977	"p77"	305530.046	4095006.608	493.3517
"p13"	305582.51	4095107.207	493.4877	"p78"	305522.498	4095010.407	492.5907
"p14"	305555.007	4095096.081	491.4887	"p79"	305532.164	4095007.92	493.7647
"p15"	305554.201	4095093.842	491.2947	"p80"	305534.098	4095008.565	494.2787
"p16"	305565.462	4095090.416	492.3227	"p81"	305523.056	4095020.792	492.1517
"p17"	305552.913	4095092.254	491.6027	"p82"	305535.938	4095009.725	494.8747
"p18"	305564.284	4095088.824	491.9247	"p83"	305524.479	4095033.124	491.7517
"p19"	305552.935	4095089.092	492.1127	"p84"	305540.763	4095012.491	495.2757
"p20"	305563.988	4095088.472	491.8427	"p85"	305524.434	4095033.101	491.7767
"p21"	305563.711	4095088.214	491.9497	"p86"	305542.437	4095013.319	494.8967
"p22"	305548.179	4095077.258	492.0397	"p87"	305526.024	4095045.232	491.8537
"p23"	305563.584	4095079.774	492.6037	"p88"	305544.058	4095014.229	494.4507
"p24"	305547.999	4095077.197	492.0267	"p89"	305527.786	4095054.475	492.0477
"p25"	305541.64	4095067.499	492.3747	"p90"	305543.411	4095010.869	494.4407
"p26"	305563.108	4095067.51	493.1247	"p91"	305528.308	4095062.284	491.8677
"p27"	305537.192	4095059.31	492.3617	"p92"	305543.307	4095010.897	494.4507
"p28"	305539.055	4095058.551	492.4767	"p93"	305528.279	4095066.697	491.2397
"p29"	305563.475	4095060.193	493.7817	"p94"	305539.907	4095008.322	494.2527
"p30"	305563.485	4095049.307	494.6127	"p95"	305530.014	4095074.462	490.9427
"p31"	305540.418	4095048.551	492.9337	"p96"	305530.018	4095075.374	490.8457
"p32"	305566.958	4095037.648	495.5547	"p97"	305535.853	4095006.067	493.8487
"p33"	305544.78	4095037.86	493.6367	"p98"	305532.535	4095084.094	491.4257
"p34"	305568.927	4095025.04	496.1867	"p99"	305534.209	4095016.609	493.1747
"p35"	305552.593	4095025.438	494.6987	"p100"	305533.968	4095090.815	490.7537
"p36"	305570.727	4095012.224	496.9297	"p101"	305534.599	4095026.733	492.9817
"p37"	305557.692	4095011.392	495.5307	"p102"	305534.254	4095039.967	492.6787
"p38"	305572.026	4094998.651	497.5297	"p103"	305536.071	4095094.417	490.7367
"p39"	305559.766	4094996.754	496.4047	"p104"	305535.304	4095096.199	490.9837
"p40"	305572.987	4094984.357	498.5937	"p105"	305534.468	4095052.752	492.4577
"p41"	305561.835	4094982.868	498.0297	"p106"	305543.717	4095058.695	492.9447
"p42"	305573.852	4094971.69	500.3297	"p107"	305535.396	4095096.25	490.9697
"p43"	305564.179	4094970.422	499.9757	"p108"	305535.389	4095099.297	491.0727
"p44"	305574.358	4094969.514	500.6967	"p109"	305551.259	4095052.598	493.6927
"p45"	305564.482	4094967.205	500.6837	"p110"	305538.274	4095109.054	491.7347
"p46"	305574.343	4094965.477	502.2187	"p111"	305542.098	4095117.737	492.0937
"p47"	305564.14	4094964.292	501.6457	"p112"	305554.973	4095036.514	494.6407
"p48"	305575.276	4094954.681	503.2397	"p113"	305546.672	4095126.542	492.6387
"p49"	305565.398	4094953.356	502.6967	"p114"	305555.192	4095020.769	495.0357
"p50"	305575.763	4094943.494	504.5307	"p115"	305548.585	4095132.138	493.0507
"p51"	305565.678	4094942.701	503.9057	"p116"	305555.414	4095003.718	495.6967
"p52"	305575.531	4094934.858	505.6777	"p117"	305550.334	4095136.277	492.7717
"p53"	305566.588	4094934.178	505.2397	"p118"	305555.471	4095003.709	495.7017
"p54"	305575.489	4094926.515	507.0657	"p119"	305552.261	4095140.208	493.1817
"p55"	305566.391	4094925.213	506.6257	"p120"	305555.292	4095142.986	493.1797
"p56"	305551.138	4094921.917	505.6677	"p121"	305556.199	4095144.07	493.5227
"p57"	305537.232	4094919.758	504.9557	"p122"	305557.444	4095145.168	493.9087

Point	Easting	Northing	Elevation, m
"p123"	305559.827	4095143.538	493.8397
"p124"	305549.091	4095063.999	492.8677
"p125"	305561.897	4095146.515	494.1397
"p126"	305548.571	4095069.736	492.6267
"p127"	305565.03	4095149.104	494.2787
"p128"	305545.651	4095079.514	491.8817
"p129"	305544.97	4095083.847	491.6307
"p130"	305545.738	4095090.495	491.6997
"p131"	305546.239	4095094.021	491.1807
"p132"	305546.275	4095094.544	491.0457
"p133"	305546.619	4095095.203	491.2387
"p134"	305545.64	4095099.467	492.2817
"p135"	305549.389	4095100.516	491.4637
"p136"	305550.364	4095094.899	491.2277
"p137"	305547.36	4095107.42	491.7857
"p138"	305551.742	4095108.851	491.9167
"p139"	305558.225	4095112.068	492.3347
"p140"	305562.548	4095118.097	492.7857
"p141"	305563.859	4095121.331	492.9477
"p142"	305569.917	4095124.366	493.3657
"p143"	305573.588	4095126.54	494.0757
"p144"	305566.352	4095135.875	493.9547
"p145"	305558.91	4095152.221	494.0747
"p146"	305572.057	4095165.154	494.9347
"p147"	305558.722	4095161.777	494.9067
"p148"	305557.583	4095152.743	494.4047
"p149"	305554.073	4095161.907	493.5067
"p150"	305551.789	4095146.968	493.1197
"p151"	305547.903	4095156.965	492.9957
"p152"	305547.177	4095137.622	492.6687
"p153"	305546.103	4095136.324	492.9787
"p154"	305543.007	4095149.752	492.5497
"p155"	305541.649	4095146.737	492.6047
"p156"	305540.532	4095123.464	492.3907
"p157"	305537.212	4095140.905	491.5257
"p158"	305534.208	4095110.6	491.3077
"p159"	305535.665	4095137.627	492.1187
"p160"	305529.37	4095097.94	490.9897
"p161"	305531.809	4095133.656	490.9687
"p162"	305529.415	4095097.946	490.9767
"p163"	305530.61	4095130.175	491.5067
"p164"	305525.469	4095089.838	490.3037
"p165"	305525.115	4095089.02	489.9027
"p166"	305528.163	4095124.893	490.8877
"p167"	305524.899	4095088.3	490.3197
"p168"	305526.885	4095121.292	491.3367
"p169"	305526.429	4095118.728	491.6677
"p170"	305523.586	4095084.33	491.0147
"p171"	305524.7	4095115.619	490.9197
"p172"	305518.581	4095072.757	490.7997
"p173"	305522.375	4095109.708	490.9917
"p174"	305516.767	4095068.02	489.9657
"p175"	305515.684	4095064.864	489.5787
"p176"	305518.155	4095100.15	490.6157
"p177"	305515.564	4095062.588	490.1777
"p178"	305514.895	4095092.139	490.2987
"p179"	305512.819	4095089.497	489.8907
"p180"	305511.694	4095051.265	490.5477
"p181"	305510.424	4095084.931	489.7847
"p182"	305509.094	4095042.398	490.1487
"p183"	305508.936	4095081.042	490.2537
"p184"	305505.735	4095028.629	490.0397
"p185"	305507.543	4095075.592	491.0477
"p186"	305501.028	4095017.349	490.9057
"p187"	305499.597	4095016.729	491.1237
"p188"	305503.258	4095068.641	490.6617
"p189"	305500.05	4095064.091	489.5107

Point	Easting	Northing	Elevation, m
"p190"	305497.242	4095014.625	492.2817
"p191"	305494.524	4095011.86	492.3367
"p192"	305494.435	4095053.254	488.9087
"p193"	305494.548	4095011.897	492.3067
"p194"	305491.27	4095046.649	488.8147
"p195"	305488.327	4095042.842	488.4277
"p196"	305489.519	4095007.173	492.3897
"p197"	305489.522	4095007.173	492.3907
"p198"	305483.925	4095033.221	488.5067
"p199"	305485.98	4095003.114	491.1437
"p200"	305478.173	4095021.436	489.2077
"p201"	305486.011	4095003.142	491.1267
"p202"	305488.61	4095012.324	490.6487
"p203"	305475.226	4095010.47	489.6897
"p204"	305473.663	4094999.218	490.3237
"p205"	305494.068	4095005.795	491.7907
"p206"	305475.47	4094989.169	491.1727
"p207"	305497.456	4095000.594	491.9237
"p208"	305476.235	4094980.299	492.0667
"p209"	305494.521	4094991.506	492.3217
"p210"	305489.15	4094977.655	493.0497
"p211"	305475.808	4094971.246	493.2397
"p212"	305476.284	4094962.846	494.4687
"p213"	305487.127	4094963.282	494.6877
"p214"	305474.923	4094957.939	495.3347
"p215"	305484.702	4094956.613	495.8357
"p216"	305484.716	4094954.669	496.4967
"p217"	305474.935	4094955.303	496.1017
"p218"	305484.929	4094944.268	497.6157
"p219"	305475.128	4094945.23	497.1687
"p220"	305474.318	4094936.044	498.4797
"p221"	305483.649	4094934.064	499.1707
"p222"	305480.911	4094923.71	500.5287
"p223"	305473.321	4094925.581	500.1087
"p224"	305472.689	4094922.843	500.6757
"p225"	305458.731	4094923.623	499.9137
"p226"	305447.594	4094926.585	499.2717
"p227"	305460.95	4094936.922	497.9457
"p228"	305449.416	4094937.772	497.5737
"p229"	305463.792	4094946.59	496.7227
"p230"	305465.088	4094952.881	496.0987
"p231"	305451.568	4094950.38	495.9407
"p232"	305466.015	4094955.992	495.5237
"p233"	305452.32	4094957.005	494.8507
"p234"	305452.619	4094960.107	493.6927
"p235"	305466.887	4094960.165	494.6027
"p236"	305466.467	4094966.748	493.5537
"p237"	305454.107	4094975.376	491.4437
"p238"	305467.602	4094973.826	492.5187
"p239"	305454.645	4094988.038	490.0317
"p240"	305469.063	4094982.914	491.5077
"p241"	305456.275	4095000.948	489.1037
"p242"	305469.439	4094995.507	490.3607
"p243"	305458.565	4095017.842	488.4907
"p244"	305458.537	4095017.845	488.4647
"p245"	305470.448	4095004.681	489.7857
"p246"	305471.532	4095015.227	489.2427
"p247"	305458.562	4095032.516	487.3857
"p248"	305472.246	4095026.418	488.4577
"p249"	305461.377	4095039.977	487.2787
"p250"	305461.637	4095041.913	486.9887
"p251"	305473.14	4095036.828	487.7617
"p252"	305463.692	4095049.68	487.5187
"p253"	305474.461	4095043.329	487.8387
"p254"	305474.166	4095044.328	487.5397
"p255"	305466.548	4095060.381	487.7837
"p256"	305465.107	4095062.218	487.9167

Point	Easting	Northing	Elevation, m
"p257"	305474.114	4095045.338	487.9127
"p258"	305476.107	4095050.24	488.0137
"p259"	305467.251	4095062.856	488.6327
"p260"	305469.504	4095063.342	489.3417
"p261"	305477.725	4095055.814	488.2657
"p262"	305478.306	4095058.524	488.1657
"p263"	305471.248	4095064.286	488.8187
"p264"	305479.836	4095065.795	488.6567
"p265"	305463.684	4095061.466	488.5717
"p266"	305474.586	4095066.576	488.3607
"p267"	305461.166	4095060.553	487.6157
"p268"	305468.347	4095066.433	488.0107
"p269"	305480.79	4095076.628	488.9107
"p270"	305482.992	4095080.127	489.6577
"p271"	305470.234	4095078.565	488.7647
"p272"	305484.871	4095082.835	489.3127
"p273"	305470.191	4095085.267	488.4857
"p274"	305486.46	4095085.046	489.4897
"p275"	305470.601	4095091.39	487.7407
"p276"	305488.121	4095086.94	488.5887
"p277"	305470.774	4095093.638	487.6847
"p278"	305488.221	4095088.408	488.1317
"p279"	305488.22	4095088.347	488.1187
"p280"	305473.322	4095103.093	488.5067
"p281"	305490.264	4095090.309	488.2197
"p282"	305473.929	4095107.857	488.1147
"p283"	305474.855	4095113.291	488.1647
"p284"	305492.264	4095093.248	489.1817
"p285"	305494.777	4095100.517	489.6167
"p286"	305474.552	4095119.072	488.2607
"p287"	305474.551	4095119.127	488.2097
"p288"	305495.531	4095104.855	489.2147
"p289"	305496.23	4095106.768	488.3747
"p290"	305475.39	4095125.012	488.8337
"p291"	305476.903	4095130.191	489.2347
"p292"	305496.932	4095110.225	488.3227
"p293"	305477.068	4095132.415	488.8707
"p294"	305499.812	4095114.625	488.5987
"p295"	305502.516	4095122.281	489.2877
"p296"	305477.917	4095139.408	489.3717
"p297"	305504.667	4095127.754	490.3877
"p298"	305477.932	4095139.816	489.1337
"p299"	305506.764	4095131.346	491.7637
"p300"	305478.102	4095145.285	489.4567
"p301"	305469.487	4095146.231	489.4187
"p302"	305469.452	4095146.231	489.4117
"p303"	305468.774	4095147.907	488.8407
"p304"	305509.784	4095135.8	490.7957
"p305"	305510.332	4095144.003	490.7257
"p306"	305477.545	4095146.807	489.3767
"p307"	305477.553	4095146.211	488.7527
"p308"	305510.519	4095144.922	490.7717
"p309"	305477.652	4095145.479	489.4297
"p310"	305513.113	4095153.155	490.4757
"p311"	305483.913	4095148.268	490.1277
"p312"	305515.828	4095161.142	490.9477
"p313"	305481.301	4095149.99	489.7787
"p314"	305517.493	4095169.499	491.3567
"p315"	305481.31	4095150.166	489.7827
"p316"	305521.19	4095176.422	491.6137
"p317"	305523.945	4095182.526	491.8667
"p318"	305484.819	4095156.547	490.2767
"p319"	305485.604	4095156.095	489.8077
"p320"	305528.841	4095186.054	491.9427
"p321"	305531.161	4095183.719	491.7407
"p322"	305487.547	4095154.707	490.4527
"p323"	305491.973	4095158.16	490.5397

Point	Easting	Northing	Elevation, m
"p324"	305524.536	4095177.978	491.4667
"p325"	305529.566	4095174.067	491.9617
"p326"	305491.203	4095160.099	490.3257
"p327"	305487.709	4095162.375	490.5917
"p328"	305531.151	4095171.125	493.1227
"p329"	305532.939	4095169.217	494.0017
"p330"	305489.083	4095163.631	490.4057
"p331"	305489.992	4095165.504	490.5877
"p332"	305527.666	4095161.691	492.7467
"p333"	305492.309	4095163.297	491.3257
"p334"	305524.723	4095159.373	491.3237
"p335"	305495.455	4095162.259	490.7667
"p336"	305530.047	4095154.06	491.1857
"p337"	305533.32	4095156.842	491.7977
"p338"	305499.717	4095169.445	490.8157
"p339"	305535.039	4095159.351	491.5607
"p340"	305503.114	4095172.088	491.8687
"p341"	305505.897	4095177.101	491.2417
"p342"	305536.901	4095161.862	491.7167
"p343"	305540.084	4095166.294	492.3637
"p344"	305514.575	4095185.269	491.4257
"p345"	305544.134	4095179.55	492.4987
"p346"	305540.612	4095186.438	492.1127
"p347"	305538.647	4095187.08	491.7277
"p348"	305530.344	4095182.708	491.7737
"p349"	305525.301	4095177.722	491.6957
"p350"	305522.472	4095172.148	491.2617
"p351"	305516.597	4095166.209	490.9927
"p352"	305515.054	4095159.904	490.5097
"p353"	305510.3	4095150.083	490.1867
"p354"	305503.843	4095146.199	489.7827
"p355"	305497.199	4095141.211	489.4907
"p356"	305490.108	4095134.927	489.1797
"p357"	305486.591	4095126.602	488.5147
"p358"	305479.563	4095120.514	488.3117
"p359"	305476.136	4095117.282	488.1657
"FE10"	305676.801	4095101.733	500.4777
"FE11"	305722.346	4095086.254	502.9987
"FE12"	305768.473	4095072.252	505.4787
"FE13"	305814.288	4095058.19	507.7067
"FE14"	305860.256	4095044.18	510.1947
"FE15"	305905.956	4095029.83	512.6377
"FE16"	305956.06	4095013.421	515.2627
"PST1"	305965.526	4095003.865	516.3767
"PST2"	305963.939	4095000.504	516.1817
"PST3"	305963.194	4094998.069	515.6237
"PST4"	305962.992	4094997.357	515.2347
"PST5"	305962.344	4094996.252	515.9417
"PST6"	305961.503	4094993.786	517.3467
"PST7"	305958.179	4094994.054	517.3067
"PST8"	305958.355	4094996.95	515.6247
"PST9"	305959.211	4094998.982	514.6187
"PST10"	305960.454	4095001.521	514.9147
"PST11"	305961.082	4095003.396	514.9807
"PST12"	305962.365	4095005.643	515.9927
"PST13"	305959.109	4095006.942	515.5177
"PST14"	305957.371	4095002.372	514.5257
"PST15"	305956.796	4095000.815	513.6107
"PST16"	305956.657	4094997.852	514.4567
"PST17"	305955.591	4094994.78	517.1827
"PST18"	305952.561	4094995.786	516.7097
"PST19"	305953.338	4094998.564	515.2647
"PST20"	305954.562	4095000.278	514.3307
"PST21"	305955.166	4095001.602	514.3467
"PST22"	305956.718	4095006.169	514.7687
"PST23"	305957.312	4095008.397	515.1177
"PST24"	305957.657	4095001.926	514.4867

Point	Easting	Northing	Elevation, m
"PST25"	305946.72	4095005.141	513.6867
"RT1"	305943.83	4095006.445	513.4877
"RT2"	305940.684	4095006.985	512.9597
"RT3"	305932.6	4095010.849	512.4587
"RT4"	305926.339	4095011.665	512.1817
"RT5"	305918.838	4095013.464	512.0717
"RT6"	305918.851	4095013.339	512.0357
"RT7"	305917.103	4095013.952	511.5897
"RT8"	305912.765	4095015.421	510.9277
"RT9"	305903.651	4095017.166	510.4087
"RT10"	305898.689	4095016.644	510.0757
"RT11"	305887.673	4095020.302	509.1667
"RT12"	305885.848	4095019.705	509.1117
"RT13"	305881.777	4095020.693	508.7917
"RT14"	305876.963	4095022.642	508.0717
"RT15"	305837.563	4095031.245	506.2177
"RT16"	305841.945	4095037.614	506.5237
"RT17"	305833.123	4095027.32	505.2047
"RT18"	305825.095	4095025.015	504.6727
"RT19"	305817.149	4095021.616	504.2687
"RT20"	305812.254	4095022.081	504.2617
"RT21"	305807.536	4095023.264	504.0537
"RT22"	305801.288	4095027.362	503.8667
"RT23"	305793.061	4095035.753	503.6027
"RT24"	305787.093	4095038.376	503.3507
"RT25"	305783.879	4095035.893	503.1387
"RT26"	305782.86	4095032.86	503.0327
"RT27"	305779.812	4095032.526	502.9297
"RT28"	305772.978	4095030.94	502.6247
"RT29"	305772.286	4095030.403	502.1837
"RT30"	305768.47	4095028.483	501.7067
"RT31"	305769.134	4095028.615	502.1137
"RT32"	305764.847	4095027.565	501.1947
"RT33"	305762.083	4095026.498	501.2297
"RT34"	305758.554	4095026.509	500.9397
"RT35"	305753.929	4095025.048	500.5457
"RT36"	305745.627	4095025.605	500.3317
"RT37"	305736.521	4095016.872	499.8937
"RT38"	305734.95	4095018.766	499.7407
"RT39"	305725.671	4095021.217	499.3267
"RT40"	305721.14	4095022.018	499.2207
"PSST1"	305971.878	4094988.665	518.1427
"PSST2"	305969.491	4094989.506	517.9817
"PSST3"	305967.421	4094990.214	517.5407
"PSST4"	305965.652	4094990.991	517.2177
"PSST5"	305963.291	4094991.598	517.3757
"PSST6"	305962.798	4094990.512	517.2357
"PSST7"	305962.411	4094989.011	517.1507
"PSST8"	305961.925	4094987.818	517.1817
"PSST9"	305961.119	4094985.833	518.0897
"PSST10"	305958.326	4094982.067	519.2487
"PSST11"	305960.715	4094981.07	518.8747
""	305962.469	4094983.502	518.3007
""	305963.88	4094986.153	517.6817
""	305964.503	4094987.273	517.1567
""	305965.291	4094988.621	517.1607
""	305966.553	4094990.242	517.2977
""	305969.157	4094989.673	517.5487
""	305968.286	4094987.983	517.5497
""	305971.424	4094986.628	518.1617
""	305967.828	4094985.904	517.5747
""	305971.19	4094985.419	517.9607
""	305967.77	4094984.543	517.6337
""	305966.452	4094982.914	518.2107
"PSST24"	305964.117	4094978.29	519.0747
"PSST25"	305966.652	4094976.919	519.6527
"PSST26"	305968.327	4094980.532	518.7707

Point	Easting	Northing	Elevation, m
"PSST27"	305970.524	4094983.805	518.6397
"PSST27"	305969.841	4094982.35	518.5507
"PSST27"	305963.596	4094988.588	517.1007
"PSST27"	305960.949	4094990.136	516.8627
"RRT1"	305952.773	4094992.058	516.3997
"RRT1"	305942.928	4094995.007	515.6857
"RRT1"	305937.977	4094996.451	515.1087
"RRT1"	305933.431	4094997.88	514.5827
"RRT1"	305928.031	4094999.696	513.8217
"RRT1"	305923.449	4095000.858	513.4647
"RRT1"	305916.303	4095002.724	512.4347
"RRT1"	305913.482	4095003.643	512.1857
"RRT1"	305912.148	4095003.019	511.8727
"RRT10"	305907.03	4095003.919	511.3217
"RRT10"	305897.531	4095006.704	510.4527
"RRT10"	305890.133	4095008.146	509.9727
"RRT10"	305884.571	4095010.85	509.1487
"RRT10"	305872.46	4095015.43	508.5087
"RRT10"	305860.379	4095020.472	507.6587
"RRT10"	305848.408	4095024.536	506.7627
"RRT10"	305837.312	4095024.396	505.5737
"RRT10"	305831.156	4095024.383	505.0507
"PSSST1"	305934.586	4094941.811	521.3457
"PSSST2"	305933.718	4094939.712	521.1417
"PSSST3"	305931.132	4094935.113	521.9327
"PSSST4"	305929.453	4094932.75	521.5637
"PSSST5"	305932.29	4094937.201	521.5237
"PSSST6"	305930.135	4094938.564	521.1147
"PSSST7"	305929.027	4094931.83	521.8807
"PSSST8"	305927.301	4094934.422	521.3307
"PSSST9"	305928.365	4094936.454	521.1107
"PSSST10"	305925.832	4094937.65	520.5897
"PSSST11"	305927.037	4094934.4	521.5427
"PSSST12"	305924.885	4094936.559	520.5117
"PSSST13"	305927.088	4094940.338	520.4807
"PSSST14"	305931.449	4094940.265	520.4557
"PSSST15"	305932.215	4094943.135	520.6257
"PSSST16"	305930.269	4094943.164	521.1527
"PSSST17"	305927.924	4094943.664	520.6987
"PSSST18"	305927.666	4094943.29	520.7097
"PSSST19"	305929.526	4094941.424	520.3507
"PSSST20"	305926.339	4094941.228	520.1937
"PSSST21"	305924.145	4094944.051	520.7677
"PSSST22"	305921.232	4094941.357	520.4537
"PSSST23"	305921.615	4094944.615	520.7877
"PSSST24"	305918.324	4094944.803	520.6227
"PSSST25"	305918.342	4094941.834	520.3477
"PSSST26"	305913.723	4094941.876	519.9137
"RTTT1"	305902.023	4094946.829	518.4867
"RTTT2"	305898.97	4094950.567	518.1407
"RTTT3"	305892.015	4094959.367	516.9717
"RTTT4"	305891.981	4094961.078	516.3797
"RTTT5"	305891.275	4094967.347	515.2337
"RTTT6"	305893.628	4094969.81	514.8947
"RTTT7"	305894.5	4094972.012	514.6267
"RTTT8"	305895.645	4094974.071	514.3097
"RTTT9"	305895.612	4094974.093	514.3057
"RTTT10"	305895.465	4094975.523	513.8967
"RTTT11"	305893.551	4094984.517	512.4417
"RTTT12"	305894.202	4094998.137	511.1077
"RTTT13"	305894.206	4094991.679	511.7547
"RTTT14"	305891.038	4095007.577	510.0977
"RTTT15"	305890.083	4095003.072	510.3157
"RTTT16"	305841.634	4095012.918	507.2587
"RTTT17"	305833.516	4095014.881	505.8437
"RTTT18"	305809.838	4095018.416	504.4907
"RTTT19"	305806.584	4095019.277	504.0477

Point	Easting	Northing	Elevation, m
"BAS1"	305797.86	4095020.238	503.7647
"BAS2"	305796.933	4095030.06	503.8007
"BAS3"	305794.182	4095019.933	503.7897
"BAS4"	305793.811	4095032.834	503.7717
"BAS5"	305788.504	4095019.835	503.7067
"BAS6"	305788.673	4095019.937	503.6667
"BAS7"	305787.001	4095026.727	503.2927
"BAS8"	305790.813	4095033.621	503.5507
"BAS9"	305784.336	4095038.018	503.3807
"BAS10"	305791.109	4095038.545	503.5137
"BAS11"	305791.076	4095038.53	503.5537
"BAS12"	305781.264	4095036.964	503.3807
"RBAS1"	305775.663	4095040.025	502.8827
"RBAS2"	305773.952	4095040.992	503.3737
"RBAS3"	305749.377	4095054.741	502.3757
"RBAS4"	305736.528	4095061.389	501.4647
"RBAS5"	305716.084	4095069.531	500.7327
"RBAS6"	305701.151	4095075.267	500.3377
"RBAS7"	305686.298	4095080.04	499.9097
"RBAS8"	305673.98	4095083.566	497.7777
"RBAS9"	305653.732	4095090.356	496.2417
"RBAS10"	305742.529	4095072.935	502.0107
"RBAS11"	305637.581	4095096.389	495.2617
"RBAS12"	305729.494	4095078.147	501.4207
"RBAS13"	305620.914	4095102.167	494.5787
"RBAS14"	305722.864	4095079.437	501.3947
"RBAS15"	305620.915	4095102.301	494.5757
"RBAS16"	305713.511	4095081.102	500.3547
"RBAS17"	305701.031	4095085.64	500.3477
"RBAS18"	305693.257	4095088.072	499.9297
"RBAS19"	305688.147	4095090.33	499.5637
"RBAS20"	305680.915	4095091.929	498.3637
"RBAS21"	305670.032	4095096.282	497.4957
"RBAS22"	305656.55	4095099.255	496.3727
"RBAS23"	305646.36	4095101.686	496.2287
"RBAS24"	305646.342	4095101.71	496.2277
"RBAS25"	305640.275	4095103.412	495.6127
"RBAS26"	305628.246	4095108.956	495.2567
"RBAS27"	305624.268	4095110.096	495.1887
"RBAS28"	305626.877	4095128.558	495.8387
"RBAS29"	305625.678	4095125.001	495.9407
"RBAS30"	305623.508	4095117.712	495.8237
"RBAS31"	305628.295	4095133.038	496.0167
"RBAS32"	305630.33	4095138.651	496.1167
"RBAS33"	305618.076	4095093.153	494.9567
"RBAS34"	305614.04	4095079.565	495.1207
"RBAS35"	305614.31	4095073.003	495.0957
"RBAS36"	305613.582	4095073.4	494.8437
"RBAS37"	305613.812	4095071.298	494.2437
"RBAS38"	305611.866	4095065.076	494.1407
"RBAS39"	305616.999	4095064.875	494.2037
"RBAS40"	305622.061	4095059.693	494.4187
"RBAS41"	305628.203	4095056.71	494.3727
"RBAS42"	305632.45	4095054.246	494.8237
"RBAS43"	305639.622	4095052.113	495.2567
"RBAS44"	305646.505	4095050.875	495.6097
"RBAS45"	305650.672	4095050.993	495.6867
"RBAS46"	305660.116	4095048.099	496.0717
"RBAS47"	305665.519	4095052.271	496.4267
"RBAS48"	305664.296	4095042.705	496.2857
"RBAS49"	305671.171	4095045.314	496.5577
"RBAS50"	305677.904	4095042.601	496.6997
"RBAS51"	305682.323	4095039.085	496.6547
"RBAS52"	305629.345	4095134.852	496.2657
"RBAS53"	305614.1	4095191.774	497.6517
"RBAS54"	305588.219	4095117.392	494.6297
"ST1"	305653.253	4095207.319	500.6037

Point	Easting	Northing	Elevation, m
"ST2"	305646.07	4095213.65	500.3017
"ST3"	305635.636	4095206.021	499.2807
"ST4"	305625.655	4095198.831	498.4597
"ST5"	305628.332	4095192.601	498.3667
"ST6"	305640.045	4095200.939	499.4147
"ST7"	305646.923	4095198.551	499.8827
"ST8"	305642.124	4095190.792	499.3107
"ST9"	305636.681	4095193.195	498.9947
"ST10"	305638.044	4095179.98	498.5667
"ST11"	305631.602	4095181.109	498.2527
"ST12"	305634.099	4095162.743	497.3997
"ST13"	305627.769	4095165.746	497.2237
"ST14"	305631.896	4095148.961	496.5327
"ST15"	305625.087	4095150.881	496.3917
"ST16"	305628.069	4095134.447	495.8167
"ST17"	305621.203	4095135.435	495.6407
"ST18"	305623.015	4095125.416	495.4837
"ST19"	305615.779	4095128.065	495.3607
"ST20"	305618.948	4095121.798	495.2587
"ST21"	305611.962	4095117.979	494.6547
"ST22"	305612.273	4095118.096	495.0047
"ST23"	305605.5	4095123.239	494.9587
"ST24"	305604.089	4095116.349	494.7957
"ST25"	305598.555	4095122.993	494.8007
"ST26"	305597.553	4095116.432	494.7037
"ST27"	305586.306	4095122.952	494.1787
"ST28"	305589.008	4095118.816	494.5897
"ST29"	305586.335	4095128.634	494.6937
"ST30"	305581.919	4095123.078	494.4907
"ST31"	305581.967	4095133.875	494.6877
"ST32"	305575.689	4095130.829	494.4497
"ST33"	305579.727	4095139.367	494.7557
"ST34"	305573.232	4095137.54	494.5217
"ST35"	305571.909	4095142.654	494.4567
"ST36"	305579.571	4095151.319	494.9277
"ST37"	305579.579	4095151.323	494.9197
"ST38"	305573.822	4095155.579	494.8607
"ST39"	305581.874	4095156.841	495.0717
"ST40"	305576.076	4095160.367	494.9617
"ST41"	305586.233	4095161.912	495.2557
"ST42"	305581.836	4095167.017	495.1307
"ST43"	305586.252	4095161.929	495.2667
"ST44"	305590.215	4095173.403	495.6317
"ST45"	305593.747	4095167.304	495.5887
"PO1"	305614.424	4095152.951	495.5887
"PO2"	305616.077	4095143.164	495.4377
"PO3"	305611.488	4095134.672	495.4007
"PO4"	305600.659	4095130.442	495.3037
"PO5"	305595.677	4095131.524	495.2677
"PO6"	305588.019	4095137.527	495.1267
"PO7"	305545.104	4095137.236	491.5857
"PO8"	305586.146	4095149.5	495.1617
"PO9"	305589.69	4095155.995	495.3747
"PO10"	305595.078	4095159.574	495.5777
"PO11"	305600.828	4095160.589	495.7327
"PO12"	305607.756	4095159.041	495.7527
"INT1"	305615.57	4095142.921	495.1267
"INT2"	305615.2	4095149.969	495.2297
"M1"	305629.899	4095139.266	495.9207
"M2"	305630.44	4095139.186	496.6147
"jj"	305620.116	4095115.4	495.1927
"jj"	305620.278	4095108.784	494.7477
"jj"	305619.761	4095102.617	494.6197
"jj"	305617.335	4095096.125	494.6417
"jj"	305620.142	4095102.761	494.5847
"jj"	305621.814	4095095.934	494.7267
"jj"	305623.2	4095089.025	495.3827

Point	Easting	Northing	Elevation, m
"jj"	305623.773	4095082.074	495.6167
"jj"	305623.502	4095075.88	495.6307
"jj"	305624.58	4095067.692	494.5657
"jj"	305624.612	4095059.752	494.5767
"jj"	305625.243	4095057.511	494.4537
"jj"	305625.055	4095055.485	494.7507
"jj"	305624.548	4095048.173	495.6857
"jj"	305624.008	4095041.153	496.4707
"jj"	305626.26	4095031.61	497.3847
"jj"	305627.289	4095024.142	498.2137
"jj"	305627.997	4095015.799	498.9897
"jj"	305628.737	4095005.896	500.3147
"jj"	305630.037	4094996.516	501.8197
"jj"	305630.258	4094986.712	502.9617
"jj"	305631.781	4094976.95	504.3777
"jj"	305634.916	4094971.345	505.7587
"jj"	305639.507	4094961.589	506.5867
"jj"	305641.978	4094952.015	507.6847
"jj"	305646.494	4094943.308	508.7637
"jj"	305651.213	4094935.501	509.7997
"jj"	305658.271	4094927.493	511.5687
"jj"	305662.487	4094920.07	513.8297
"jj"	305668.825	4094912.74	515.1737
"jj"	305672.809	4094903.853	516.8017
"jj"	305675.272	4094895.37	518.3907
"jj"	305675.282	4094885.397	519.4287
"jj"	305676.53	4094875.425	521.3437
"jj"	305679.206	4094866.733	522.6537
"jj"	305665.069	4094863.305	522.3527
"jj"	305662	4094867.777	521.0287
"jj"	305657.069	4094873.584	519.2207
"jj"	305651.073	4094879.982	517.8697
"jj"	305644.573	4094887.678	516.2667
"jj"	305639.853	4094895.356	514.9387
"jj"	305636.555	4094905.103	513.4797
"jj"	305634.044	4094914.432	512.0147
"jj"	305632.289	4094923.825	510.6567
"jj"	305628.494	4094931.266	509.5147
"jj"	305626.621	4094941.775	508.2487
"jj"	305623.144	4094951.32	507.0997
"jj"	305617.327	4094962.762	505.7817
"jj"	305613.499	4094971.007	504.8517
"jj"	305611.809	4094976.984	503.4047
"jj"	305609.761	4094984.427	502.3127
"jj"	305607.609	4094994.243	501.1757
"jj"	305606.234	4095005.757	500.1317
"jj"	305604.768	4095015.964	499.1867
"jj"	305604.324	4095027.357	498.1517
"jj"	305604.959	4095039.242	496.8307
"jj"	305606.801	4095050.811	495.4947
"jj"	305607.164	4095061.596	494.4417
"jj"	305608.162	4095066.095	494.0797
"jj"	305609.416	4095070.663	494.3437
"jj"	305607.904	4095077.876	494.4057
"jj"	305606.409	4095087.16	494.5597
"jj"	305606.514	4095096.737	494.0517
"jj"	305607.456	4095107.385	494.2047
"jj"	305606.778	4095113.693	494.7027
"jj"	305595.123	4095112.925	494.4037
"jj"	305596.772	4095102.129	493.6517
"jj"	305597.705	4095091.009	493.8907
"jj"	305596.251	4095078.981	494.0937
"jj"	305595.129	4095074.105	493.3557
"jj"	305594.019	4095072.323	493.5307
"jj"	305592.438	4095057.206	494.9427
"jj"	305590.26	4095043.478	496.3637
"jj"	305589.629	4095040.313	496.8537
"jj"	305590.207	4095035.525	497.9647
"jj"	305590.85	4095032.253	497.7467
"jj"	305593.783	4095021.558	498.3757
"jj"	305597.056	4095006.618	499.4707
"jj"	305600.603	4094992.479	500.7937
"jj"	305602.85	4094981.919	502.1737
"jj"	305604.676	4094974.488	503.4107
"jj"	305606.396	4094970.922	504.2607
"jj"	305606.838	4094967.569	505.1417
"jj"	305608.881	4094963.467	505.6227
"jj"	305610.962	4094948.799	506.6037
"jj"	305611.306	4094935.795	508.1817
"jj"	305610.829	4094928.226	509.2587
"jj"	305611.242	4094925.01	510.3747
"jj"	305610.103	4094911.897	511.9637
"jj"	305611.56	4094899.477	513.6817
"jj"	305615.965	4094887.239	515.1907
"jj"	305619.762	4094873.372	517.0227
"	305583.517	4094863.907	-99999 "
"jj"	305566.965	4094869.206	518.1957
"jj"	305604.371	4094871.573	517.0737
"jj"	305601.588	4094883.788	515.6197
"jj"	305598.658	4094894.851	514.3387
"jj"	305596.385	4094905.517	513.0547
"jj"	305594.954	4094913.07	512.2937
"jj"	305592.77	4094918.013	510.7877
"jj"	305590.42	4094925.413	509.5837
"jj"	305590.376	4094927.923	508.5707
"jj"	305589.511	4094932.335	507.3087
"jj"	305588.177	4094945.71	505.2547
"jj"	305586.45	4094957.769	503.7747
"jj"	305584.844	4094966.894	503.1727
"jj"	305584.874	4094970.027	502.4857
"jj"	305584.608	4094972.064	501.9237
"jj"	305583.907	4094974.589	501.2657
"jj"	305583.364	4094977.111	500.4097
"jj"	305581.421	4094989.022	499.1167
"jj"	305580.585	4094999.203	498.4557
"jj"	305578.733	4095011.855	497.7227
"jj"	305577.3	4095026.488	496.9367
"jj"	305577.343	4095038.961	496.2787
"jj"	305576.535	4095050.833	495.2877
"jj"	305576.115	4095064.451	493.9257
"jj"	305576.942	4095079.093	492.9667
"jj"	305576.584	4095082.023	492.3947
"jj"	305576.09	4095086.371	492.5697
"jj"	305575.862	4095091.701	492.7377
"jj"	305576.579	4095094.13	493.6347
"jj"	305578.46	4095099.322	493.6817
"jj"	305579.157	4095101.901	494.3407
"jj"	305579.458	4095103.86	493.4297
"jj"	305580.066	4095107.307	493.2537
"jj"	305582.51	4095118.491	494.3327
"jj"	305647.638	4095147.899	499.9997